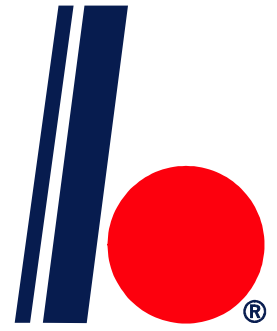


**BERCHTOLD**



## **Service manual**

**LED surgical lights, single and combination lights  
CHROMOPHARE® E 778, E 668, E 558**



**Read the instructions before beginning any work.**

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# **1 General**

## **1.1 About this operating manual**

This operating manual provides important instructions on how to handle the device. For safe operation, observe all safety and operating instructions.

Local accident prevention and general safety regulations also apply.

Read the operating manual thoroughly before beginning any work. The manual is considered part of the product and must be kept in the vicinity of the device at all times for reference by personnel.

If the device is transferred, the operating manual must be included.

The illustrations in this manual are intended to provide a better understanding of the device; they are not necessarily drawn to scale and may deviate slightly from the actual model.

## General

### 1.2 Definition of symbols used

#### Warnings

Symbols are used to indicate warnings in this manual. A signal word that reflects the extent of the danger precedes each warning.

Observe all warning notices and exercise extreme caution to prevent accidents, injuries and property damage.



#### **DANGER!**

Indicates an immediately dangerous situation that, if not avoided, will result in death or serious bodily injury.



#### **WARNING!**

Indicates a possibly dangerous situation that, if not avoided, can result in death or serious bodily injury.



#### **CAUTION!**

Indicates a possibly dangerous situation that, if not avoided, can result in moderate or minor injuries.



#### **CAUTION!**

Indicates a possibly dangerous situation that, if not avoided, can result in damage to property.

#### Tips and recommendations



#### **NOTE!**

*Highlights useful tips, recommendations and information for efficient and trouble-free operation.*

**Special safety notices**

To draw attention to particular dangers, the following symbol is used in combination with safety notices:



**DANGER!**  
**Risk of death from electrical current!**

Indicates life-threatening situations resulting from electrical current. Disregarding the safety notice can result in serious injury or death.

Work may be performed by electrical technicians only.

## General

### 1.3 Limited liability

All specifications and notices in this manual were compiled using applicable standards and regulations, the current state of technology and our many years of experience and knowledge.

The manufacturer assumes no liability for damages resulting from

- Non-compliance with the operating instructions.
- Improper operation.
- Work performed by untrained personnel.
- Unauthorized modifications.
- Technical changes.
- Installation of non-approved spare parts.
- Performance of unauthorized installation and maintenance work.

Explanations and illustrations presented herein may deviate from the actual product delivered in the case of special models, additional options or the latest technical changes.

Furthermore, all obligations agreed to in the delivery contract, the general terms and conditions, the manufacturer's delivery terms, and any regulations legally valid at the time the contract is concluded apply.

We reserve the right to make technical modifications to improve and further develop the product.

## 1.4 Copyright protection

The operating manual should be treated as confidential. It is exclusively for the use of persons handling the device. The operating manual may not be transferred to third parties without written approval from BERCHTOLD.



**NOTE!**

*The specifications, text, drawings, pictures and other illustrations contained herein are protected by copyright and are subject to industrial property rights. Improper application is punishable by law.*

Making photocopies of any type or form, including excerpts hereof, as well as using and/or sharing the content of this manual requires written consent from BERCHTOLD. Violators will be liable for damages. Further claims remain reserved.

## 1.5 Consumables



**WARNING!**

**Risk of injury if incorrect consumables used.**

Incorrect or defective consumables can cause damage, malfunction or complete failure of the product and compromise safety.

Therefore:

- Use only original BERCHTOLD parts.

Purchase consumables from authorized dealers or directly from BERCHTOLD (address ⇒ back of manual).

## General

### 1.6 Warranty provisions

The warranty provisions and general terms and conditions can be found on and downloaded from the Internet (⇒ back of manual).

### 1.7 Customer service

For technical questions, contact the BERCHTOLD Technical Customer Service.

To find out who your contact is, call, fax, e-mail or contact us via the Website at any time (⇒ back of manual).

### 1.8 CE mark

The device meets the requirements of the EU directive on medical products 93/42/EEG.

You will find the CE mark on the model plate (⇒ model plate).

## 2 Safety

This section provides an overview of all important safety information for optimal protection of personnel and safe and trouble-free operation.

Non-compliance with the operating and safety instructions in this manual can result in considerable danger.

### 2.1 Responsibility of the operator

The device is used in a commercial space. Therefore, the operator of the device is subject to legal workplace safety regulations.

In addition to the occupational safety warnings presented in this manual, the operator must observe all the safety, accident-prevention and environmental protection regulations related to the field of application. In particular, the following apply:

- The operator must familiarize him- or herself with the valid occupational safety regulations and identify by means of a risk assessment any additional risks that result from the specific working conditions where the device is used. Such risks must be presented in the form of operating instructions.
- For the entire duration of device use, the operator must verify that the operating instructions created comply with current regulations and modify them if necessary.
- The operator must control and define clearly the responsibilities for installing, operating, maintaining and cleaning the device.
- The operator must ensure that all employees who handle the device have read and understood the operating manual. Furthermore, the operator must periodically train personnel and review the dangers.
- The operator must provide personnel with the required protective equipment.

The operator is also responsible for keeping the device in proper technical working order; the following apply:

- The operator must adhere to the maintenance intervals ( Maintenance Schedule) specified in this manual.
- The operator must have all safety facilities checked regularly for proper function and completeness.

## Safety

### 2.2 Personnel requirements



#### **WARNING!**

**Risk of injury if operated by insufficiently trained personnel!**

Incorrect handling can result in serious bodily injury and property damage.

Therefore:

- All activities are to be carried out only by qualified personnel.
- Consult the manufacturer if there is any doubt concerning maintenance activities.
- Repairs should be performed only by the manufacturer or authorized technical personnel.

The following qualifications apply for these various ranges of tasks:

#### ■ **Medical specialists (surgeons, surgical personnel)**

are able to safely perform the assigned tasks by virtue of their medical education, knowledge and experience.

Medical specialists can independently detect, assess and avoid possible hazards to themselves or the patients.

Medical specialists understand all valid regulations, guidelines and standards required by law for safe use of the device and are able to implement them accordingly.

Medical specialists have the required technical knowledge for properly using the device in the area of application and comply with all hygiene regulations for rooms used for medical purposes and for the use of medical devices.

■ **Installation personnel**

Only employees of BERCHTOLD or its authorized agents may install and perform the initial start-up of the product.

Due to the heavy weight and high torque involved, only appropriately trained and experienced technicians may install surgical lighting.

■ **A skilled electrician,**

on the basis of his or her training, **skills and** experience and well as knowledge of relevant standards and regulations is able to work on electrical systems and can independently detect and avoid possible dangers.

A skilled electrician is trained for the specific installation site and knows the relevant standards and regulations.

## Safety

### 2.3 Intended use

The device is designed and constructed exclusively for the use as described herein.

CHROMOPHARE® surgical lights are medical lights for use in hospital treatment rooms. They provide localized lighting focused on the patient's body for detecting and treating disease, injury, and disability. Surgical lights may be used only in rooms used for medical purposes and that have been constructed in accordance with regulations VDE 0100-710 or IEC 60364-7-10.



**WARNING!**

**Danger if not used as intended!**

Dangerous situations can result any time the device is used for purposes beyond or other than those intended.

Therefore:

- Use the device only as intended.
- Strictly adhere to all specifications in this operating manual.
- Only BERCHTOLD personnel or technicians expressly authorized by BERCHTOLD may install, modify or repair the devices.

The following uses are prohibited, in particular:

- Operation in areas where there is danger of explosion. The surgical lights are a potential source of ignition.
- Operation with a damaged underglass or filter system.
- Placement of objects on the light head or hanging objects from the swivel arms and light head.

Claims of any kind due to damage resulting from improper use are excluded.

The operator is solely responsible for damages resulting from improper use.

## Safety

### 2.4 Reliability

As single lights, CHROMOPHARE® surgical lights provide a high degree of reliability because the individual LED modules are controlled separately from one another and the LED modules as well as their emitters have a long service life. Additionally, the light head is highly reliable because of the number of LEDs used. If individual LEDs fail, the function of the light head is not compromised. If individual LED modules fail, the intensity is reduced.

Do not use single lights for operations during which a failure could seriously endanger the patient.

Light combinations with two or even three light heads provide greater security against light failure and provide better illumination of the surgical field. They provide light from various angles and maximum protection against failure through double and triple redundancy. This is particularly true if they are connected to an emergency power supply in addition to the mains supply. These types of combination lights may be used in all medical disciplines for lighting surgical areas.

## 2.5 Personal protective equipment

To minimize health risks, personal protective equipment must be worn while working.

- Always wear the required protective equipment for the given task.
- Observe instructions posted in the work area regarding personal protective equipment.

### Protective equipment for special tasks

Certain tasks require special protective equipment. These tasks are discussed individually in the various sections of this manual. The special protective equipment covered is:



#### Safety goggles

Protect the eyes from projectile objects and fluids.

## 2.6 Specific risks

The following section lists residual risks identified by a risk analysis.

- Be sure to observe the safety instructions and warning notices provided in the later sections of this manual to reduce health risks and avoid dangerous situations.

## Safety

### Electrical current



#### **DANGER!**

##### **Risk of death from electrical current!**

Touching live electrical components is life threatening. Damage to insulation or individual components can cause fatal injury.

Therefore:

- If insulation is damaged, immediately switch off power supply and initiate repairs.
- Electrical work is to be performed by skilled electricians only.
- To perform any electrical work, disconnect the unit from the power supply and verify that it is dead.
- Before performing any maintenance, cleaning or repairs, switch off the power supply and ensure it cannot be accidentally switched on.
- Do not bypass or deactivate fuses. Make sure the amperage is correct when changing fuses.
- Keep conductive parts away from humidity. It can cause a short circuit.

### EMC risks (flat screens)



#### **WARNING!**

##### **Use of non-EMC flat screens and switched-mode power supplies is life threatening.**

Radiation disturbances can skew measurement results of medical devices (e.g., monitoring of vital functions). This can result in life-threatening situations.

Therefore:

- Use only UL- or IEC-rated (UL60601-1, IEC 60601-1) flat screens and switched-mode power supplies.

## 2.7 Environmental protection



### **CAUTION!**

#### **Environmental hazard from incorrect handling!**

Incorrect handling of environmentally hazardous substances, especially incorrect disposal, can result in significant damage to the environment.

Therefore:

- Always observe the following instructions.
- Take appropriate measures immediately should hazardous substances accidentally be released into the environment. In case of doubt, notify the responsible local authorities regarding the damage.

The following environmentally hazardous substances are used:

### **Lubricants**

Lubricants such as grease and oil contain poisonous substances. They should not be released into the environment. Disposal must be handled by disposal specialists.

## 2.8 Labeling



### **Hot surface (on the lighting system)**

Hot surfaces are not always obvious.  
Allow to cool before handling.



### **Electrical current (on the soffit)**

Only skilled electricians may work in these areas.

## Technical Data

### 3 Technical Data

#### 3.1 General information

The cardanic suspension of CHROMOPHARE® surgical lights is available on a number of models.

- Classic cardanic (A.C.) for normal ceiling heights.
- Shortened classic cardanic (sA.C.) for medium-high to low ceiling heights.
- Flat cardanic (N.C.) for low ceiling heights.

Features in the following tables are marked "A.C.," "sA.C." or "N.C.," as appropriate.

The weights and maximum torques are specific to single lights (including transformer and anchor plate), each with a 180-mm ceiling tube and a 900-mm cantilever (Ø 125 mm).

#### CHROMOPHARE® E 778

Specifications	Value	Unit
Weight incl. transformer	70	kg
Max. torque	531	Nm
Light head diameter	78	cm
Light emission surface area	3590	cm <sup>2</sup>
Max. swivel radius	235,5	cm
Lowest position of light head (N.C.)	128	cm
Highest position of light head (N.C.)	228	cm
Lowest position of light head (sA.C.)	117	cm
Highest position of light head (sA.C.)	220	cm
Lowest position of light head (A.C.)	113	cm
Highest position of light head (A.C.)	220	cm
Clearance, single light (N.C.) (with a 245.5-cm ceiling height)	200	cm

## Technical Data

### CHROMOPHARE® E 668

Specifications	Value	Unit
Weight incl. transformer	60	kg
Max. torque	495	Nm
Light head diameter	64	cm
Light emission surface area	2352	cm <sup>2</sup>
Max. swivel radius	233	cm
Lowest position of light head (N.C.)	128,5	cm
Highest position of light head (N.C.)	228	cm
Lowest position of light head (A.C.)	115	cm
Highest position of light head (A.C.)	220	cm
Clearance, single light (N.C.) (with a 245.5-cm ceiling height)	200	cm

### CHROMOPHARE® E 558

Specifications	Value	Unit
Weight incl. transformer	58	kg
Max. torque	445	Nm
Light head diameter	58	cm
Light emission surface area	1766	cm <sup>2</sup>
Max. swivel radius	229,5	cm
Lowest position of light head (N.C.)	128,5	cm
Highest position of light head (N.C.)	229	cm
Lowest position of light head (A.C.)	118	cm
Highest position of light head (A.C.)	223	cm
Clearance, single light (N.C.) (with a 245.5-cm ceiling height)	200	cm

## Technical Data

### 3.2 Connection loads

#### CHROMOPHARE® E 778

Specifications	Value	Unit
Transformer primary voltage	100/120/127	V (AC)
	220/230/240	V (AC)
Power consumption at mains during mains operation	300	VA (AC)
Power consumption at mains with DC supply	200	VA (at 24-28 V DC)
AC frequency	50/60	Hz
Safety class	1	

#### CHROMOPHARE® E 668

Specifications	Value	Unit
Transformer primary voltage	100/120/127	V (AC)
	220/230/240	V (AC)
Power consumption at mains during mains operation	250	VA (AC)
Power consumption at mains with DC supply	160	VA (at 24-28 V DC)
AC frequency	50/60	Hz
Safety class	1	

## Technical Data

### CHROMOPHARE® E 558

Specifications	Value	Unit
Transformer primary voltage	100/120/127	V (AC)
	220/230/240	V (AC)
Power consumption at mains during mains operation	220	VA (AC)
Power consumption at mains with DC supply	140	VA (at 24-28 V DC)
AC frequency	50/60	Hz
Safety class	1	

### LED emitters for CHROMOPHARE® E 778, E 668 and E 558

The CHROMOPHARE® E 778, E 668 and E 558 surgical light is equipped with an innovative light source, the LED ("light-emitting diode").

In contrast to traditional halogen or high-intensity discharge lamps, LEDs are characterized by a very long service life.

As a rule, traditional bulbs must be replaced after 1,000 to 5,000 hours of operation, while LEDs have a longer service life of at least 25,000 hours of operation.

The CHROMOPHARE® E 778 consists of a total of 14 LED modules respectively 168 LEDs. The modules vary in size and shape as follows:

- 10 hexagonal modules
- 4 semi-circular modules

The CHROMOPHARE® E 668 consists of a total of 8 hexagonal LED modules, respectively 96 LEDs.

The CHROMOPHARE® E 558 consists of a total of 6 hexagonal LED modules, respectively 72 LEDs.

The modules as such consist of 12 warm- and cool-white LEDs. Additionally, all the modules are controlled individually (CAN interface) for simplified service.

Technical Data

3.3 Operating conditions

All models

Specifications	Value	Unit
Ambient temperature	10...40	°C
Relative humidity, non-condensing	30...75	%
Barometric pressure	700...1060	hPa

3.4 Performance

The technical lighting data provided in the following tables has a tolerance of ± 10%.

## Technical Data

### CHROMOPHARE® E 778

Specifications	Value	Unit
Color temperature levels (only with Color Select option)	3600 4000 4500 5000	K K K K
Standard color temperature level (without Color Select option)	4500	K
Intensity $E_c$ at 1 m	160	klx
Electronic brightness control	80–160	klx
Total radiant power at max. intensity	600	W/m <sup>2</sup>
Total radiant power/intensity	3,7	mW/ (m <sup>2</sup> lx)
Color rendering index $R_a$	95	
Circadian effect coefficient $a_{cv}$	0,72	
Light field diameter	15-29	cm
$d_{10}$ Light field, Ø at 10 % of max. intensity	15	cm
$d_{50}$ Light field, Ø at 50 % of max. intensity	9,6	cm
Residual brightness when obstructed by one mask, with reference to $E_c$	73	%
Residual brightness when obstructed by two masks, with reference to $E_c$	52	%
Residual brightness in standardized tube, in reference to $E_c$	91	%
Residual brightness in standard tube with one shader, in relation to $E_c$	66	%
Residual brightness in standard tube with two shaders, in relation to $E_c$	47	%
Depth of illumination L1 + L2	75	cm

## Technical Data

### CHROMOPHARE® E 668

Specifications	Value	Unit
Color temperature levels (only with Color Select option)	3600	K
	4000	K
	4500	K
	5000	K
Standard color temperature level (without Color Select option)	4500	K
Intensity $E_c$ at 1 m	160	klx
Electronic brightness control	80–160	klx
Total radiant power at max. intensity	600	W/m <sup>2</sup>
Total radiant power/intensity	3,7	mW/ (m <sup>2</sup> lx)
Color rendering index Ra	95	
Circadian effect coefficient acv	0,72	
Light field diameter	15-29	cm
d10 Light field, Ø at 10 % of max. intensity	15	cm
d <sub>50</sub> Light field, Ø at 50 % of max. intensity	9,6	cm
Residual brightness when obstructed by one mask, with reference to $E_c$	70	%
Residual brightness when obstructed by two masks, with reference to $E_c$	50	%
Residual brightness in standardized tube, in reference to $E_c$	100	%
Residual brightness in standard tube with one shader, in relation to $E_c$	70	%
Residual brightness in standard tube with two shaders, in relation to $E_c$	50	%
Depth of illumination L1 + L2	80	cm

## Technical Data

### CHROMOPHARE® E 558

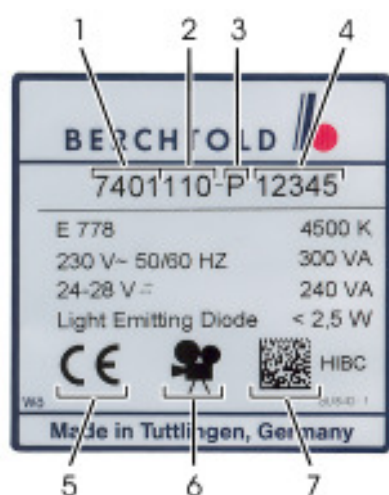
Specifications	Value	Unit
Color temperature levels (only with Color Select option)	3600 4000 4500 5000	K K K K
Standard color temperature level (without Color Select option)	4500	K
Intensity $E_c$ at 1 m	120	klx
Electronic brightness control	60–120	klx
Total radiant power at max. intensity	440	W/m <sup>2</sup>
Total radiant power/intensity	3,7	mW/ (m <sup>2</sup> lx)
Color rendering index $R_a$	95	
Circadian effect coefficient $a_{cv}$	0,72	
Light field diameter	15-29	cm
$d_{10}$ Light field, Ø at 10 % of max. intensity	15	cm
$d_{50}$ Light field, Ø at 50 % of max. intensity	9,6	cm
Residual brightness when obstructed by one mask, with reference to $E_c$	56	%
Residual brightness when obstructed by two masks, with reference to $E_c$	46	%
Residual brightness in standardized tube, in reference to $E_c$	100	%
Residual brightness in standard tube with one shader, in relation to $E_c$	56	%
Residual brightness in standard tube with two shaders, in relation to $E_c$	46	%
Depth of illumination L1 + L2	85	cm

## Technical Data

### 3.5 Emissions

A full explanation on compliance with EMC guidelines can be found in the appendix.

### 3.6 Model plate



The model plate is located next to the suspension installation point on the housing of the light head.

It contains the following information:

- 1 Version number
- 2 Model number
- 3 Year of manufacture (A = 1993, B = 1994, ...)
- 4 Sequential numbering
- 5 CE mark
- 6 Symbol for camera preparation (optional)
- 7 Health Industry Bar Code

Fig. 1 Model plate

## 4 Design and function

### 4.1 Overview

#### 4.1.1 Single lights, classic cardanic (A.C.) / shortened classic cardanic (sA.C.)

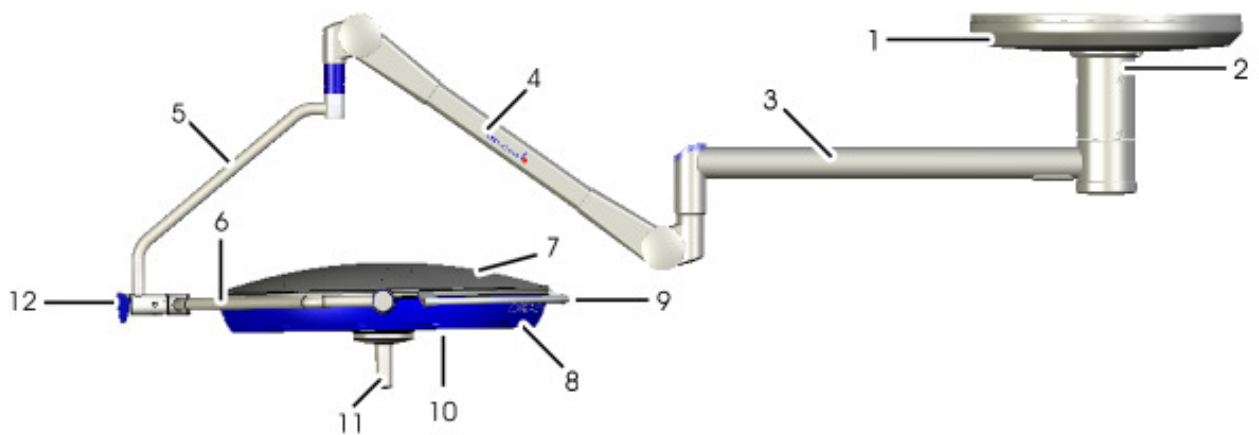


Fig. 2 CHROMOPHARE E 778, E 668 and E 558 single light components, classic cardanic / shortened classic cardanic (without height adjustment tube)

- |   |                         |    |                              |
|---|-------------------------|----|------------------------------|
| 1 | Soffit                  | 7  | Lamp housing hood            |
| 2 | Ceiling tube Ø 125 mm   | 8  | Light frame                  |
| 3 | Swivel arm              | 9  | Rail                         |
| 4 | Spring arm              | 10 | Light emission lens (facing) |
| 5 | Vertical gimbal joint   | 11 | Handle assembly              |
| 6 | Horizontal gimbal joint | 12 | Control panel                |

## Design and function

### 4.1.2 Single lights, flat cardanic (N.C.)

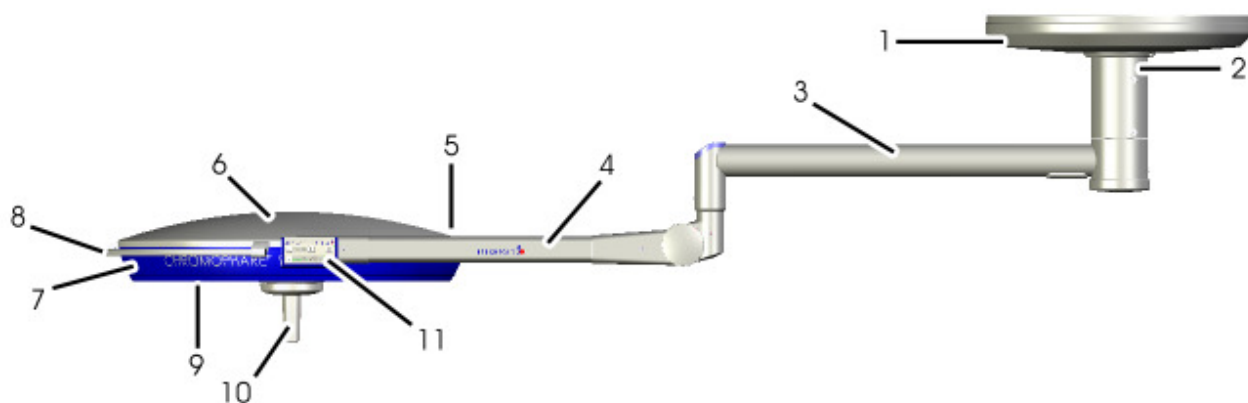


Fig. 3 CHROMOPHARE® E 778, E 668 and E 558 single light components, flat cardanic (without height adjustment tube)

- |   |                         |    |                              |
|---|-------------------------|----|------------------------------|
| 1 | Soffit                  | 7  | Light frame                  |
| 2 | Ceiling tube Ø 125 mm   | 8  | Rail                         |
| 3 | Swivel arm              | 9  | Light emission lens (facing) |
| 4 | Spring arm              | 10 | Handle assembly              |
| 5 | Horizontal gimbal joint | 11 | Control panel                |
| 6 | Lamp housing hood       |    |                              |

## Design and function

### 4.1.3 Light combination, classic cardanic (A.C.) / shortened classic cardanic (sA.C.)

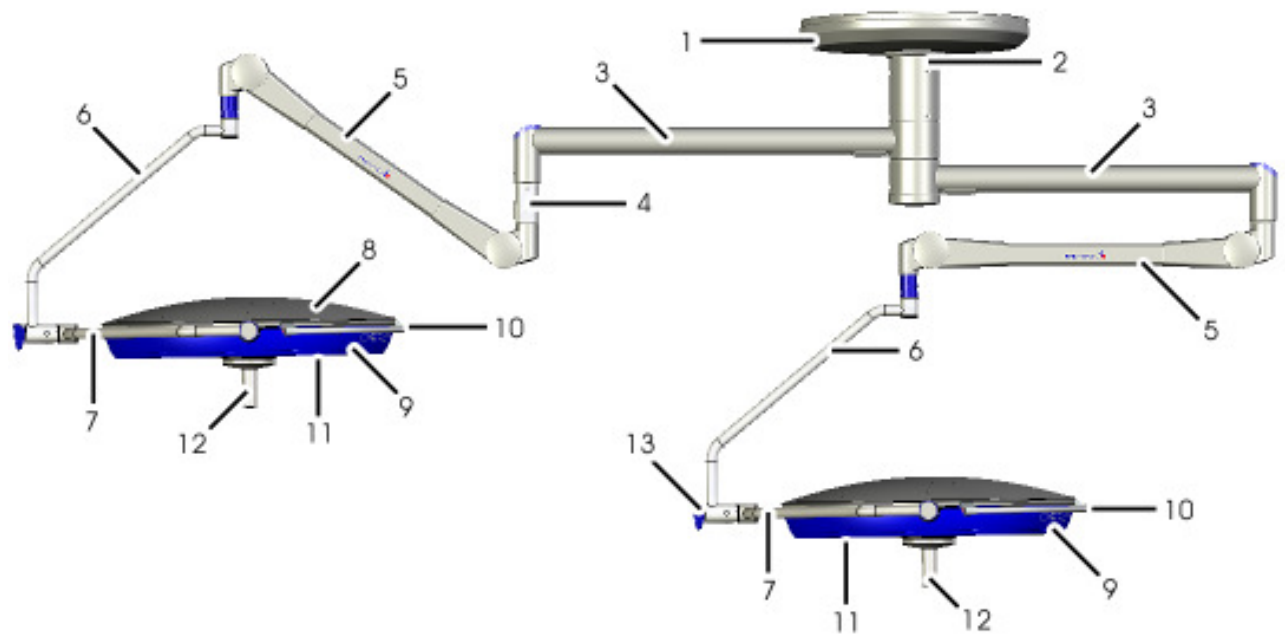


Fig. 4 CHROMOPHARE® E 778 with E 778 light combination components, classic cardanic / shortened classic cardanic

- |   |                         |    |                              |
|---|-------------------------|----|------------------------------|
| 1 | Soffit                  | 8  | Control panel                |
| 2 | Ceiling tube Ø 125 mm   | 9  | Light frame                  |
| 3 | Swivel arm              | 10 | Rail                         |
| 4 | Height adjustment tube  | 11 | Light emission lens (facing) |
| 5 | Spring arm              | 12 | Handle assembly              |
| 6 | Vertical gimbal joint   | 13 | Lamp housing hood            |
| 7 | Horizontal gimbal joint |    |                              |

## Design and function

### 4.1.4 Light combination, flat cardanic (N.C.)

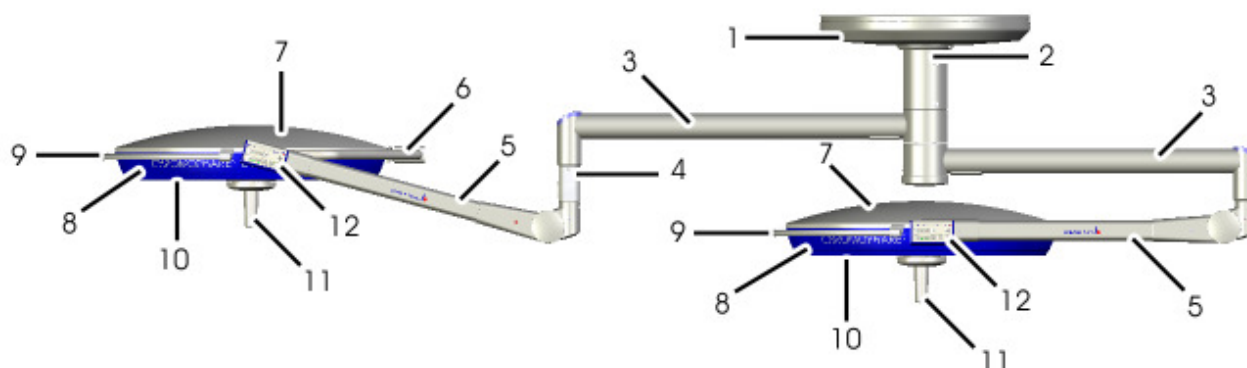


Fig. 5 CHROMOPHARE® E 778 with E 778 light combination components, flat cardanic

- |                           |                                 |
|---------------------------|---------------------------------|
| 1 Soffit                  | 7 Lamp housing hood             |
| 2 Ceiling tube Ø 125 mm   | 8 Light frame                   |
| 3 Swivel arm              | 9 Rail                          |
| 4 Height adjustment tube  | 10 Light emission lens (facing) |
| 5 Spring arm              | 11 Handle assembly              |
| 6 Horizontal gimbal joint | 12 Control panel                |

### 4.1.5 Handle assembly



Fig. 6 Overview of handle assembly

- |         |                 |
|---------|-----------------|
| 1 Focus | 2 Handle sleeve |
|---------|-----------------|

**- NOTES -**

## 5.1 Light head

### 5.1.1 CHROMOPHARE® E 778



LED surgical lights, single and combination lights CHROMOPHARE® E 778, E 668, E 558

## Sub-assembly

Position	Quantity	Part No.	Description
2	1 pcs	80036	Lower glass holder
3	1 pcs	80444	Frame
4	1 pcs	80037	Lower glass
5	1 pcs	80020	Focus mechanism
6	1 pcs	80413	Lower glass seal
7	1 pcs	80415	Frame seal
8	3 pcs	73714	Screw
9	4 pcs	357	Spring washer
10	1 pcs	80071	Side shaft cover
11	4 pcs	152	Screw M5X10 DIN 912-8,8
12	6 pcs	77035	Screw, DIN 965 - M 2.5 X 8 -A2
13	1 pcs	379	Washer A 4,3 DIN 6798 - A2
14	1 pcs	274	Screw M4X6 DIN 7985-A2

## Sub-assembly

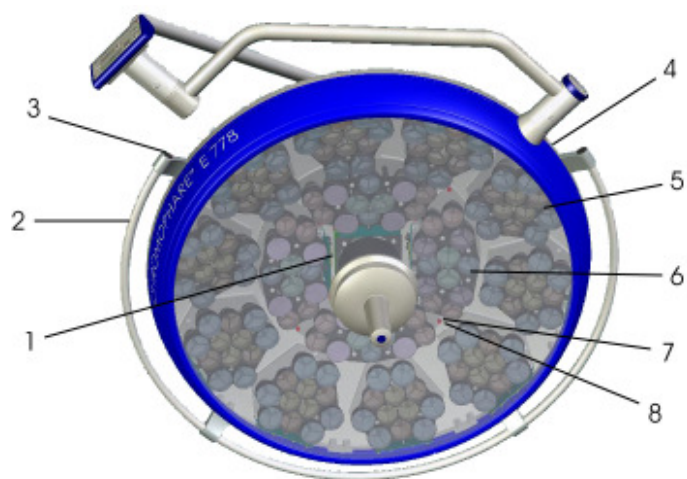


Fig. 8 Light head CHROMOPHARE® E 778

LED surgical lights, single and combination lights CHROMOPHARE® E 778, E 668, E 558

## Sub-assembly

Position	Quantity	Part No.	Description
1	1 pcs	80046	Distribution board
2	1 pcs	80419	Rail
3	2 pcs	79203	Plastic plug
4	1 pcs	80017	Lamp housing hood
5	10 pcs	80322	LED module, hexagon
6	4 pcs	80324	LED module, semi-circular
7	46 pcs	81019	Spring washer DIN 137-A 4-zinc coated
8	46 pcs	80181	Screw

## Sub-assembly

### 5.1.2 CHROMOPHARE® E 668

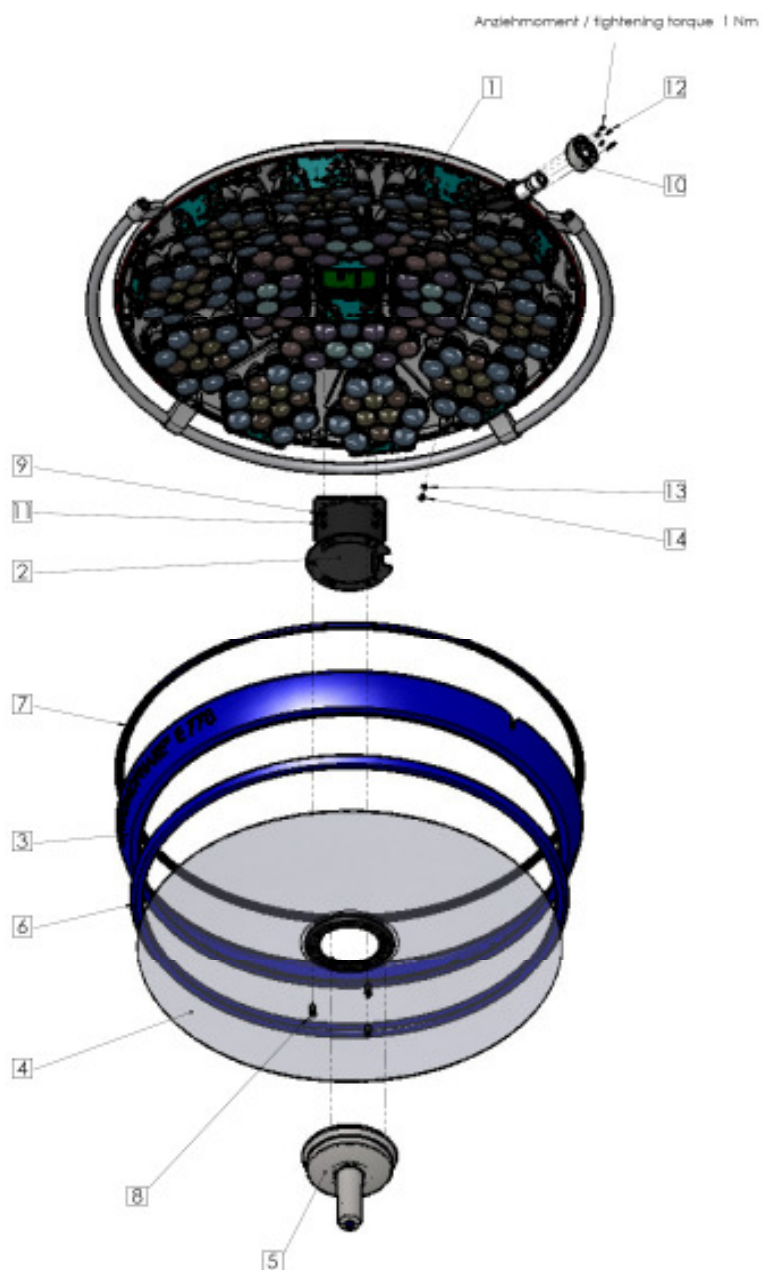


Fig. 9 Light head CHROMOPHARE® E 668

LED surgical lights, single and combination lights CHROMOPHARE® E 778, E 668, E 558

## Sub-assembly

Position	Quantity	Part No.	Description
2	1 pcs	80036	Lower glass holder
3	1 pcs	80444	Frame
4	1 pcs	80037	Lower glass
5	1 pcs	80020	Focus mechanism
6	1 pcs	80413	Lower glass seal
7	1 pcs	80415	Frame seal
8	3 pcs	73714	Screw
9	4 pcs	357	Spring washer
10	1 pcs	80071	Side shaft cover
11	4 pcs	152	Screw M5X10 DIN 912-8,8
12	6 pcs	77035	Screw, DIN 965 - M 2.5 X 8 -A2
13	1 pcs	379	Washer A 4,3 DIN 6798 - A2
14	1 pcs	274	Screw M4X6 DIN 7985-A2

## Sub-assembly

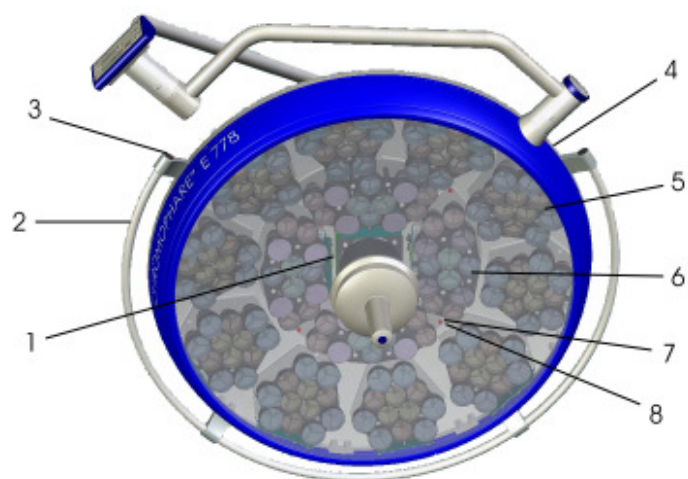


Fig. 10 Light head CHROMOPHARE® E 668

LED surgical lights, single and combination lights CHROMOPHARE® E 778, E 668, E 558

## Sub-assembly

Position	Quantity	Part No.	Description
1	1 pcs	80046	Distribution board
2	1 pcs	80489	Rail
3	2 pcs	79203	Plastic plug
4	1 pcs	80485	Lamp housing hood
5	8 pcs	81087	LED module, hexagon
6	24 pcs	81019	Spring washer DIN 137-A 4-zinc coated
7	24 pcs	80181	Screw

## Sub-assembly

### 5.1.3 CHROMOPHARE® E 558

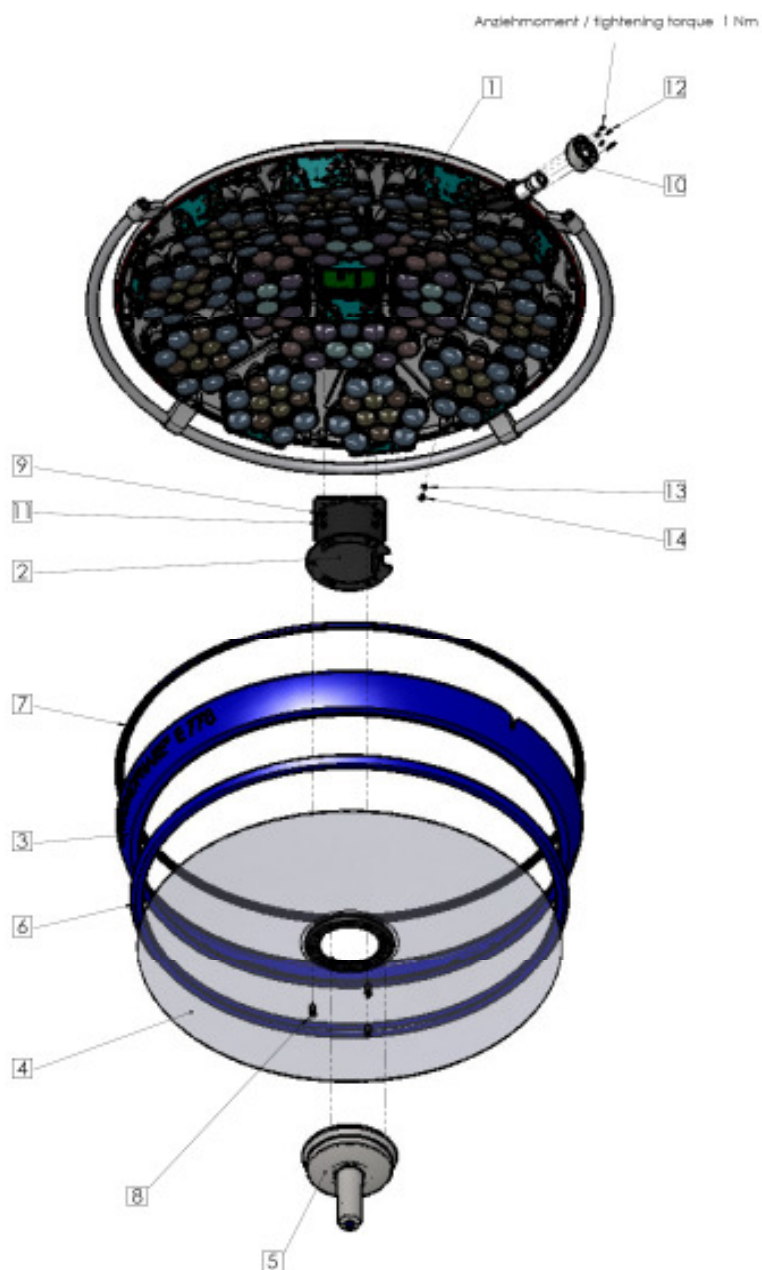


Fig. 11 Light head CHROMOPHARE® E 558

LED surgical lights, single and combination lights CHROMOPHARE® E 778, E 668, E 558

## Sub-assembly

Position	Quantity	Part No.	Description
2	1 pcs	80468	Lower glass holder
3	1 pcs	80447	Frame
4	1 pcs	80455	Lower glass
5	1 pcs	80020	Focus mechanism
6	1 pcs	80453	Lower glass seal
7	1 pcs	80451	Frame seal
8	3 pcs	73714	Screw
9	4 pcs	257	Pan head tapping screw
10	1 pcs	80071	Side shaft cover
11	4 pcs	152	Screw M5X10 DIN 912-8,8
12	6 pcs	77035	Screw, DIN 965 - M 2.5 X 8 -A2
13	1 pcs	379	Washer A 4,3 DIN 6798 - A2
14	1 pcs	274	Screw M4X6 DIN 7985-A2

## Sub-assembly

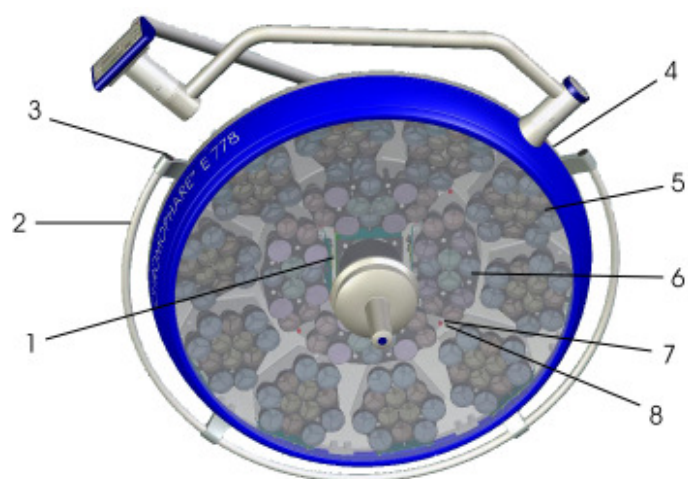


Fig. 12 Light head CHROMOPHARE® E 558

LED surgical lights, single and combination lights CHROMOPHARE® E 778, E 668, E 558

## Sub-assembly

Position	Quantity	Part No.	Description
1	1 pcs	80046	Distribution board
2	1 pcs	80449	Rail
3	2 pcs	79203	Plastic plug
4	1 pcs	80445	Lamp housing hood
5	6 pcs	81087	LED module, hexagon
6	18 pcs	81019	Spring washer DIN 137-A 4-zinc coated
7	18 pcs	80181	Screw

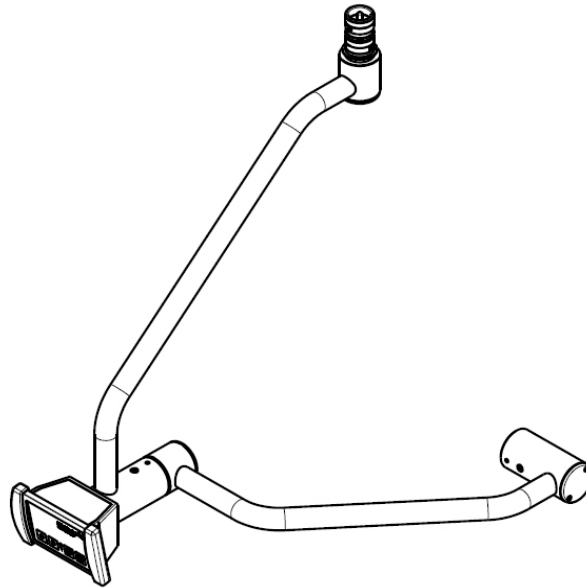
## Sub-assembly

### 5.2 Cardanics

The cardanic suspension of CHROMOPHARE® surgical lights is available on a number of models.

- Classic cardanic (A.C.) for normal ceiling heights.
- Shortened classic cardanic (sA.C.) for medium-high to low ceiling heights.
- Flat cardanic (N.C.) for low ceiling heights.

### 5.2.1 Classic cardanic (AC, carcanic control)



*Fig. 13 AC cardanic with cardanic control*

Part No.	Description
80051	Cardanic E 778 AC (incl. harness)
80462	Cardanic E 778 sAC (incl. harness)
83050	Cardanic E 668 AC (incl. harness)
80470	Cardanic E 558 AC (incl. harness)

Part No.	Description
500550	Harness cardanic E 778 AC 7-pole
500550	Harness cardanic E 778 sAC 7-pole
500550	Harness cardanic E 668 / E 558 AC 7-pole

Sub-assembly

5.2.2 Classic cardanic (AC, wall control)

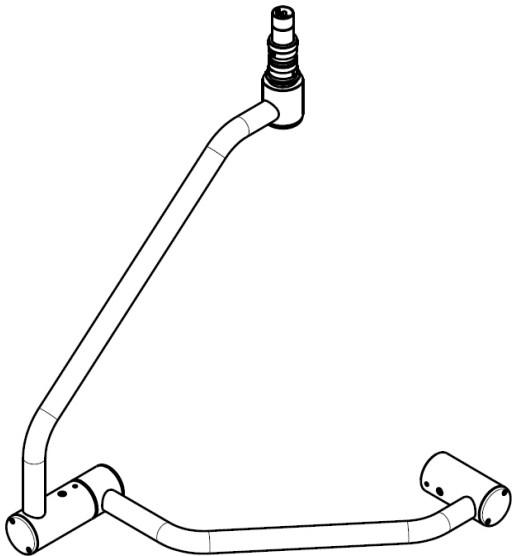
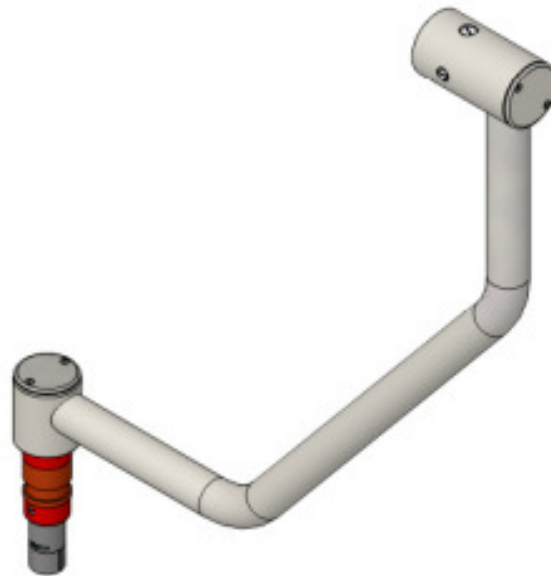


Fig. 14 AC cardanic with wall control

Part No.	Description
80463	Cardanic E 778 AC (incl. harness)
80464	Cardanic E 778 sAC (incl. harness)
83051	Cardanic E 668 AC (incl. harness)
80471	Cardanic E 558 AC (incl. harness)

Part No.	Description
500550	Harness cardanic E 778 AC 7-pole
500550	Harness cardanic E 778 sAC 7-pole
500550	Harness cardanic E 668 / E 558 AC 7-pole

### 5.2.3 Flat cardanic (NC)



*Fig. 15 NC cardanic*

Part No.	Description
80460	Cardanic E 778 NC (incl. harness)
83056	Cardanic E 668 NC (incl. harness)
80477	Cardanic E 558 NC (incl. harness)

Part No.	Description
500551	Harness cardanic E 778 NC 7-pole
500568	Harness cardanic E 668 / E 558 NC 7-pole

## Connectors

# 6 Connectors

## 6.1 Pin configuration

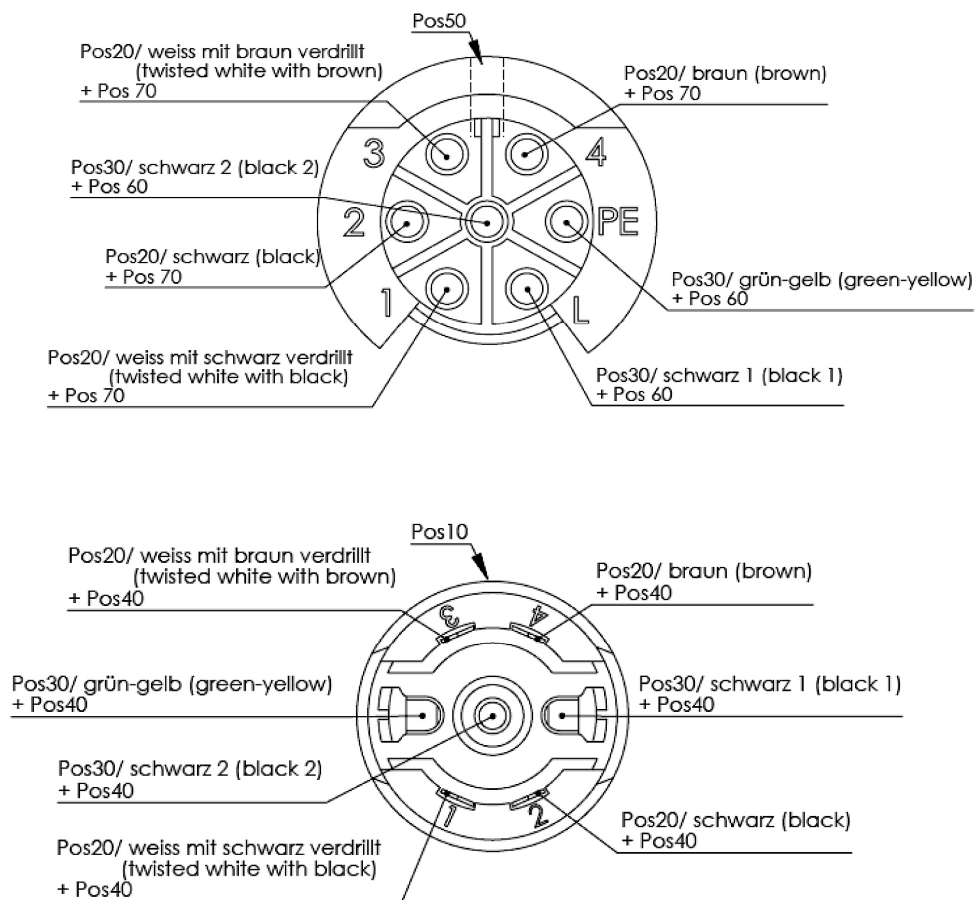


Fig. 16 Pin configuration overview

### 6.1.1 Sliding contacts

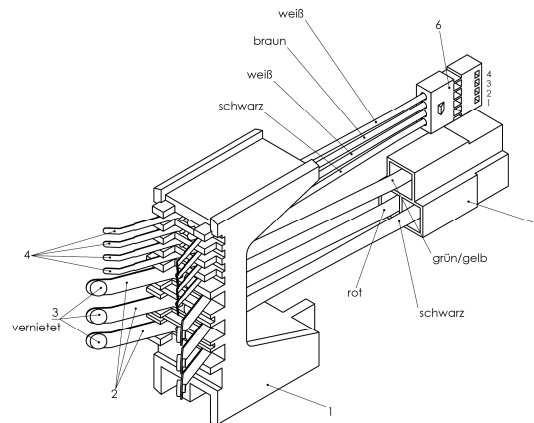


Fig. 17 Contact block

Part No.	Description
78851	Contact block

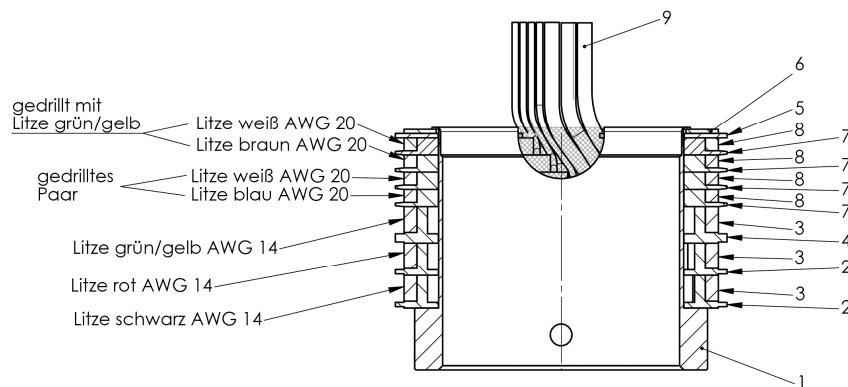


Fig. 18 Sliding ring

Part No.	Description
78849	Sliding ring

## Spring arm

### 7 Spring arm

#### 7.1 Spring arm classic cardanic (AC)

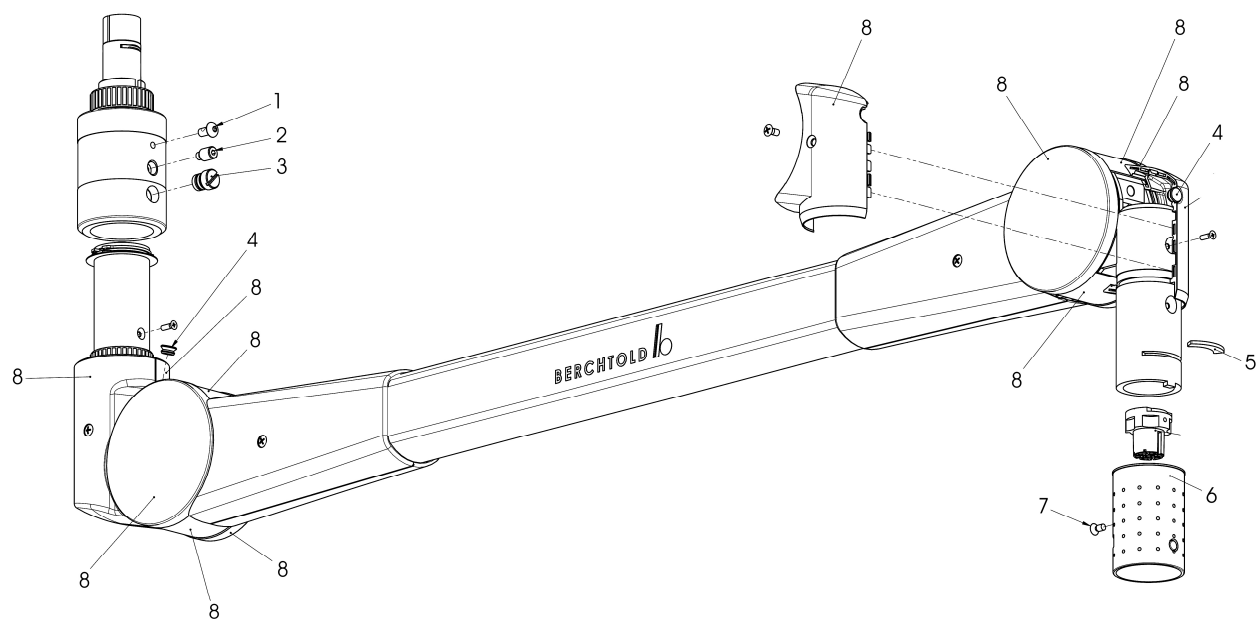


Fig. 19 Spring arm classic cardanic

LED surgical lights, single and combination lights CHROMOPHARE® E 778, E 668, E 558

## Spring arm

Position	Quantity	Part No.	Description
1		45398	Head screw
2		64126	Pivot screw
3		84010	Brake screw
4		76026	Plug (included in part no. 80672)
5		76001	Safety segment
6		74191	Safety shaft (included in part no. 80672)
7		226	Screw for cover
8		80672	Spring arm cover set AC

Part No.	Description
78905	Spring arm AC E 778
80554	Spring arm AC E 668 / E 558

Spring arm

7.2 Spring arm flat cardanic (NC, cardanic control)

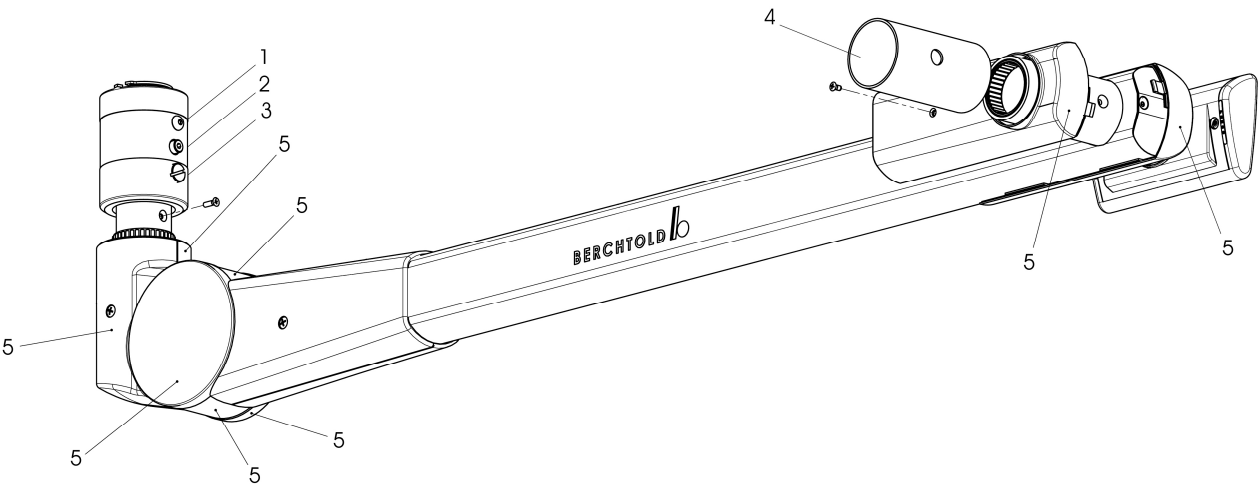


Fig. 20 Spring arm flat cardanic with cardanic control

Position	Quantity	Part No.	Description
1		78979	counter sunk head screw
2		64126	Pivot screw
3		84010	Brake screw
4		74191	Safety shaft
5		80670	Spring arm cover set NC

Part No.	Description
78906	Spring arm NC E 778
79760	Spring arm NC E 668 / E 558

### 7.3 Spring arm flat cardanic (NC, wall control)

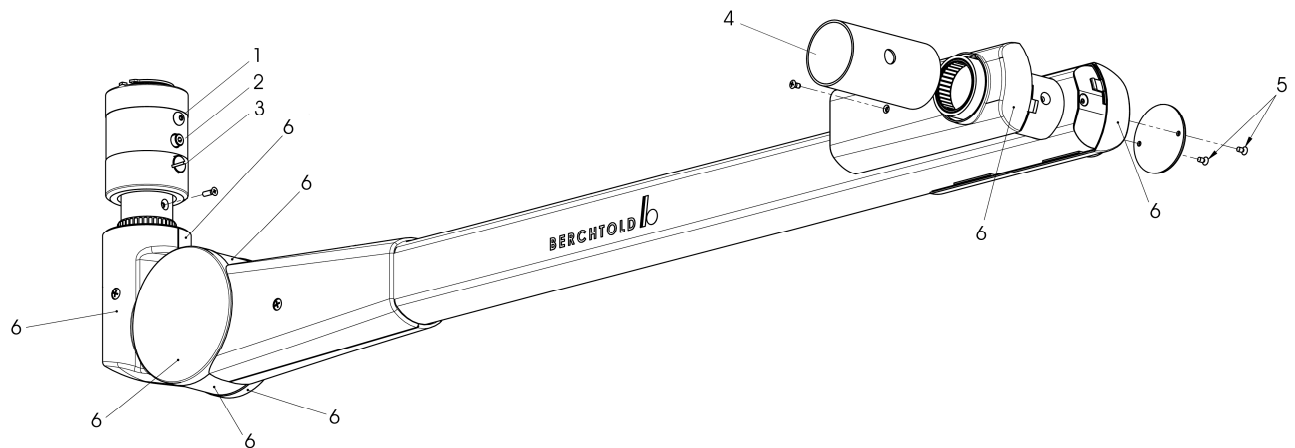


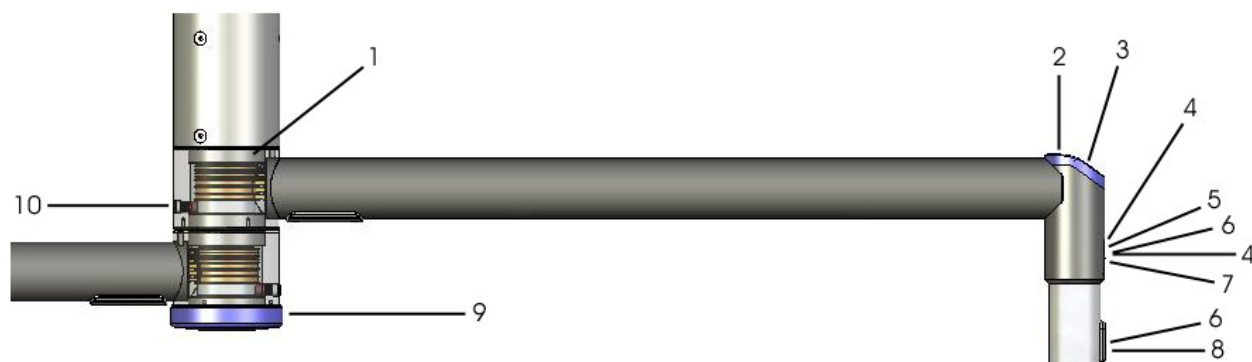
Fig. 21 Spring arm flat cardanic with wall control

Position	Quantity	Part No.	Description
1		78979	counter sunk head screw
2		64126	Pivot screw
3		84010	Brake screw
4		74191	Safety shaft
5		226	Screw for cover
6		80670	Spring arm cover set NC

Part No.	Description
78907	Spring arm NC E 778
79761	Spring arm NC E 668 / E 558

## Swivel arm

### 8 Swivel arm



Position	Part No.	Description
1	79695	Central column for single lights
	79696	Central column for double lights
2	231	Screw DIN 966 - M 3 X 16-A2
3	78862	Cover blue Ø 70 mm
4	78979	Counter sunk head screw
5	78864	Cover for suspension
6	228	Screw, M3 x 0.5x10
7	78959	Bush
8	75187	Cover
9	78870	Jar cover
10	78867	Brake screw

## 9 Keyboard

### 9.1 CHROMOPHARE® E 778, E 668, E 558

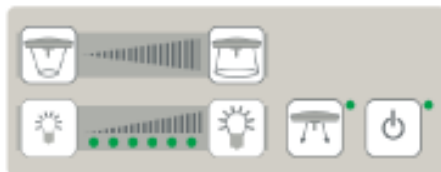


Fig. 22: Keyboard with GuideLite™

Part No.	Description
79668	Key board foil with GuideLite™



Fig. 23: Keyboard with GuideLite™ and Color Select

Part No.	Description
79667	Key board foil with GuideLite™ and Color Select

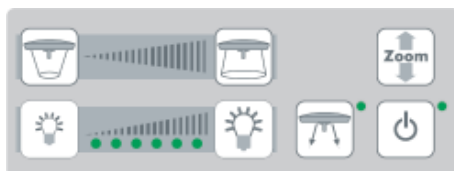


Fig. 24: Keyboard with GuideLite™ and ChromoVision® ECO

Part No.	Description
81182	Key board foil with GuideLite™ and ChromoVision® ECO



Fig. 25: Keyboard with GuideLite™, EndoLite® and Color Select

Part No.	Description
81183	Key board foil with GuideLite™, EndoLite® and Color Select



Fig. 26: Keyboard with GuideLite™ and EndoLite®

Part No.	Description
81184	Key board foil with GuideLite™ and EndoLite®

LED surgical lights, single and combination lights CHROMOPHARE® E 778, E 668, E 558

Keyboard



Fig. 27: Keyboard with GuideLite™, Color Select and ChromoVision® ECO

Part No.	Description
81185	Key board foil with GuideLite™, Color Select and ChromoVision® ECO

## 10 Wallbox

### 10.1 Flush mounted



Fig. 28: Flush mounted wallbox

Part No.	Description
81152	Single LED with Communication Interface
81153	Single LED w/o Communication Interface
81158	Double LED with Communication Interface
81159	Double LED w/o Communication Interface
81164	Triple LED with Communication Interface
81165	Triple LED w/o Communication Interface

### 10.2 Surface mounted



Fig. 29: Surface mounted wallbox

Part No.	Description
81156	Single LED with Communication Interface
81157	Single LED w/o Communication Interface
81162	Double LED with Communication Interface
81163	Double LED w/o Communication Interface
81168	Triple LED with Communication Interface
81169	Triple LED w/o Communication Interface

Wallbox

10.3 Flush mounted in tableau



Fig. 30: Flush mounted in tableau

Part No.	Description
81154	Single LED with Communication Interface
81155	Single LED w/o Communication Interface
81160	Double LED with Communication Interface
81161	Double LED w/o Communication Interface
81166	Triple LED with Communication Interface
81167	Triple LED w/o Communication Interface

## Connecting the electricity

### 11 Connecting the electricity



**NOTE!**

*Electrical installation must comply with the IEC 60364-710 European standard and the current local standards.*

*Power switches and fuses must be installed by the customer (for fuse values ⇒ appendix) or the fuses and fuse holder delivered must be used.*

*The cross-section of the connecting lines between the fuses and the transformers must be at least 1.5 mm<sup>2</sup>.*



**NOTE!**

*Detailed electrical plans may be requested from technical service (⇒ address on the inside of the back cover of the manual).*



**NOTE!**

*Pay attention to the fuse ratings on the fuse holders!*



**NOTE!**

*Fuses must be UL and IEC 60127 approved.*

## Connecting the electricity

### 11.1 Electrical connection on the ceiling tube

#### DC power supply

Use only when emergency power relays are available on site.

- DC terminals (up to 36 mm<sup>2</sup> cable cross-section)
- Equipotential bonding terminals (up to 10 mm<sup>2</sup> cable cross-section)

Transformer and emergency power relays are installed separately from the ceiling tube.

Combination lights have additional terminal pairs. Connect them as well.

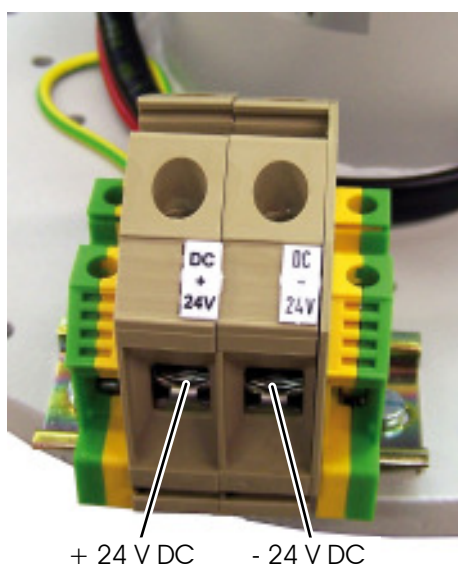


Fig. 31 DC terminals

## Connecting the electricity

### 230 V AC power supply

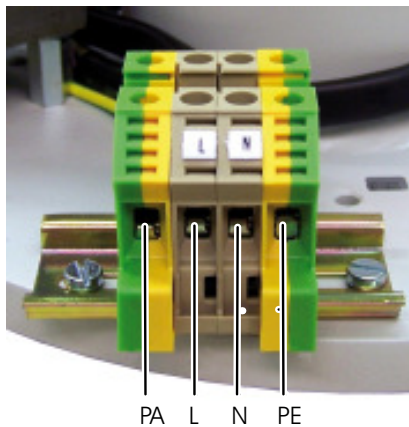


Fig. 32 Power supply terminals

Use only when 230 V emergency power relays are available on site.

#### ■ 230 V mains terminals

Transformer and filtering board have been mounted to ceiling tube.

Connect line voltage according to the country (also see transformer model plate) to terminal pair L and N. Also connect PE and PA (protective conductor and equipotential bonding).

Combination lights have additional terminal pairs. Connect them as well.

## Connecting the electricity

### 230 V AC power supply with emergency power relays

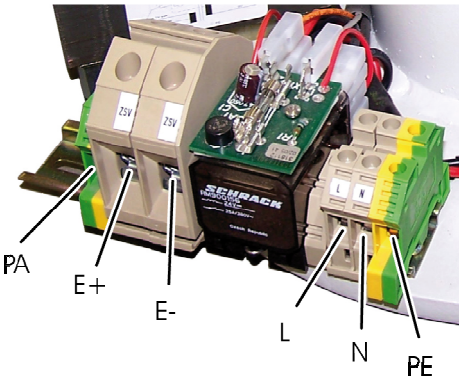


Fig. 33 Terminals for the power supply and the emergency power supply

**Input voltages:**

- Supply voltage (L1/N)
- 24-28 volt DC emergency power supply

**Output voltage at plug in ceiling tube:**

- 24-28 volt DC under load (for the surgical light)

Terminal	Connection
E +	Emergency power supply + 24-28 V DC
E -	Emergency power supply – 24-28 V DC
L	Mains AC
N	Mains AC
PA/PE	Ground

Ceiling tube of the CHROMOPHARE® surgical light with transformer, filtering board and emergency power relay mounted.

Combination lights have additional terminal pairs. Connect them as well.



**NOTE!**  
The emergency power switch-over must be ordered separately.

## Connecting the electricity

### 11.2 Electrical connections on the mounting plate

#### Mounting plate

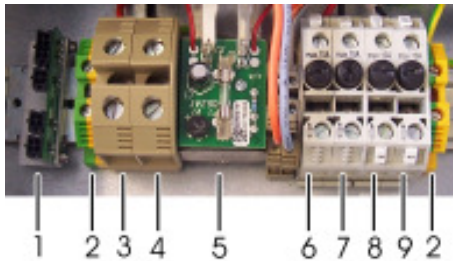


Fig. 34 Mounting plate terminals with filtering board

Use only when emergency power relays are available on site.

#### Input voltages:

- max. 28 volt DC or max. 26 volt AC

#### Output voltage:

- 24–28 volt DC to the surgical light

A drop in voltage on the line to the surgical light can be compensated for only by a corresponding increase in the DC input voltage.

Terminal	Connection
1	CAN distribution board
2	PE/PA ground
3	DC out
4	DC out
5	Emergency power switch-over relay (with emergency power relays)
6	DC in (with emergency power relays)
7	DC in (with emergency power relays)
8	AC in
9	AC in

Combination lights require an additional mounting plate with terminals. Connect them as well.



#### NOTE!

DC fuses must be installed by the customer (for fuse ratings ⇒ appendix).

## Connecting the electricity

### 26 V AC and max. 28 V DC power supply

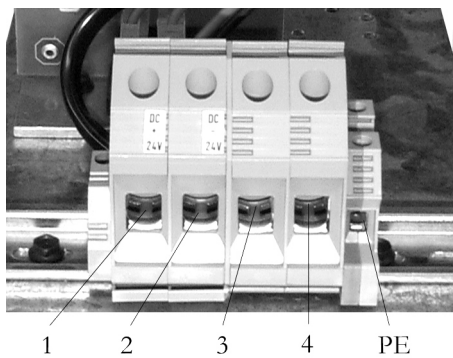


Fig. 35 Mounting plate terminals with filtering board

Use only when emergency power relays are available on site.

**Input voltages:**

- max. 28 volt DC or max. 26 volt AC

**Output voltage:**

- 24–28 volt DC to the surgical light

A drop in voltage on the line to the surgical light can be compensated for only by a corresponding increase in the DC input voltage.

Terminal	Connection
1	Output + 24–28 V DC
2	Output - 24–28 V DC
3	Input max. + 28 V DC Input max. 26 V AC
4	Input max. - 28 V DC Input max. 26 V AC
PE	Ground

Combination lights require an additional mounting plate with terminals. Connect them as well.

## Connecting the electricity

### 11.2.1 Electrical connections for ChromoVision® camera system HD and 1 C

#### Connections on ceiling flange

Use only when emergency power relays are available on site.

See circuit diagram (request a copy from technical service,  
⇒ *inside of back cover*).

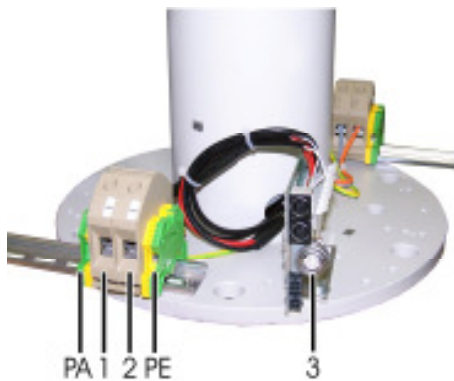


Fig. 36 Ceiling flange connections



**NOTE!**

*Do not shorten the 15 m camera cable!*

Terminal	Connection
1	Input 24 V DC
2	Input 24 V DC
3	Camera cable connector port
PE/PA	Ground

Connecting the electricity

11.2.2 Electrical connections for ChromoVision® ECO camera system

Connections on ceiling flange

Use only when emergency power relays are available on site.

See circuit diagram (request a copy from technical service, ⇨ inside back cover).



Fig. 37: Ceiling flange connections



**NOTE!**  
Do not shorten the 15 m camera cable!

Terminal	Connection
1	Input 24 V DC
2	Input 24 V DC
3	Y/C socket, video
PE/PA	Ground

## Connecting the electricity

### 11.2.3 Electrical connections with wall control box

#### Connections on ceiling tube

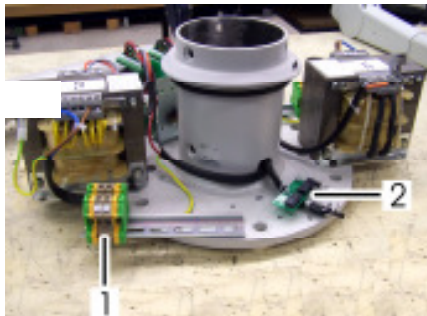


Fig. 38 Ceiling flange connections

Ceiling tube of the CHROMOPHARE® surgical light.

Position	Circuit Boards
1	230 V connection
2	CAN distribution board: Connection for wall control box (wall box)

Combination lights have additional terminal pairs that must also be connected.

Connecting the electricity

11.3 Connecting the camera distribution board

11.3.1 ChromoVision® camera system HD and 1 C

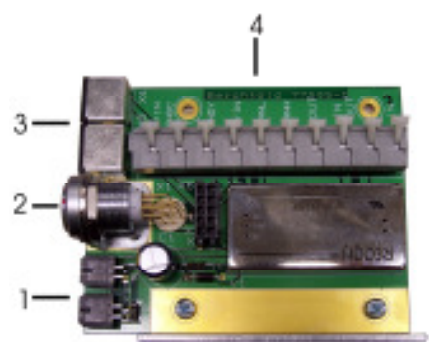


Fig. 39 Camera distribution board

Connection/ Position	Connection
1	CAN BUS
2	12-pin connection (for camera cable)
3	2x Y/C video connection
4	Terminal strip (see table for connections)

Terminal strip	Function
C/IN	Video Signal C input
GNDC	Ground Video Signal C input
GNDY	Ground Video Signal Y input
Y/IN	Video Signal Y input
CANL	CAN BUS LOW Signal
CANH	CAN BUS HIGH Signal
+OUT	+Ub to light head
+IN	+Ub from supply
–OUT	–Ub to light head
–N	–Ub from supply

## Connecting the electricity

### 11.3.2 ChromoVision® ECO camera system



Connection/ Position	Connection
1	Y/C socket, video

Fig. 40: ECO connector

## Mechanical adjustments

# 12 Mechanical adjustments

## 12.1 Diagrams

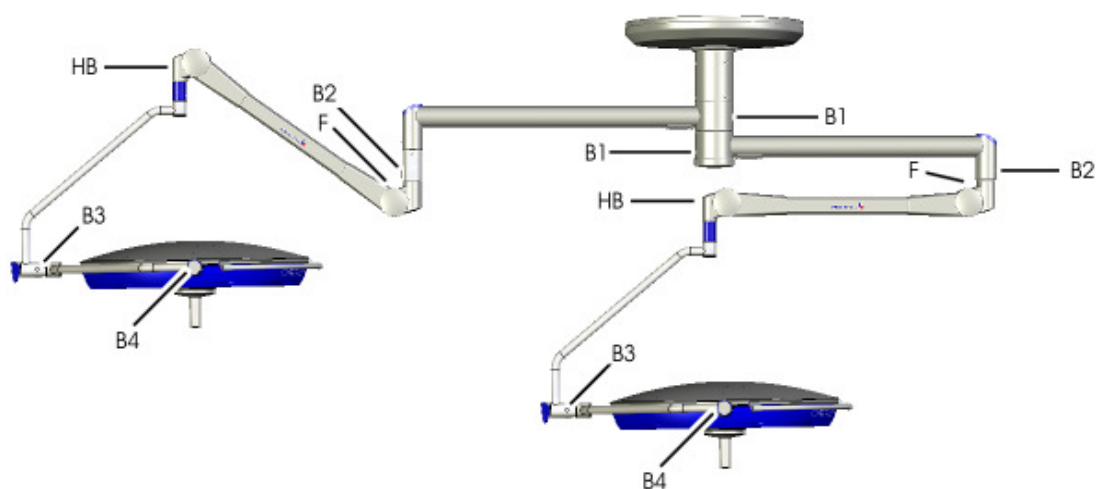


Fig. 41 Adjustment points, classic cardanic

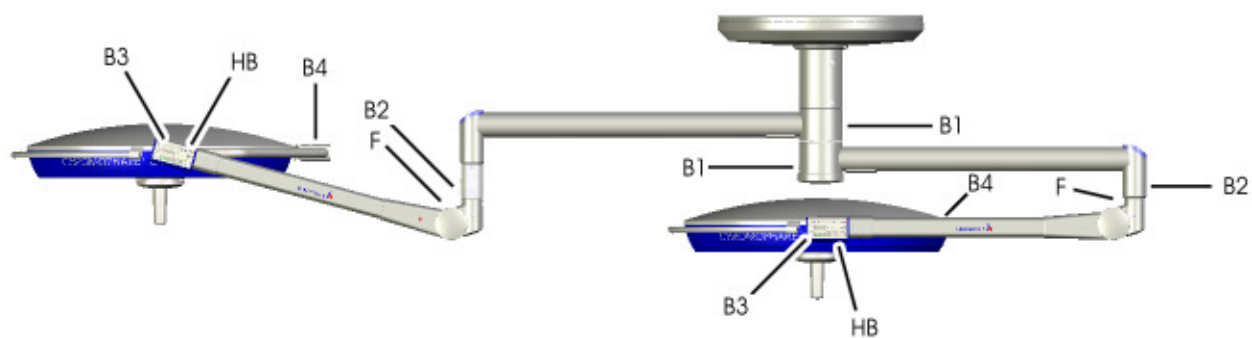


Fig. 42 Adjustment points, flat cardanic

Abbreviation	Adjustment element
B	Brake screw
F	Spring tension adjustment
HB	Height limit

## Mechanical adjustments

### 12.2 Adjusting the brakes



#### NOTE!

*The following steps apply to spring arms mounted to a height adjustment tube as well as spring arms mounted directly to the swivel arm.*

Adjust the braking action of the individual joints so that the light head stays in any given position. If the suspension arm of the surgical light drifts, tighten or replace the appropriate brake screw.



#### CAUTION!

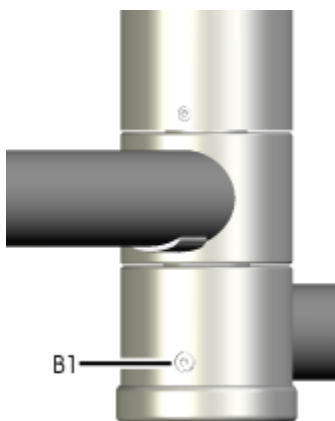
##### **Risk of injury if braking action of joints fail!**

If the brake screws are lubricated or residual lubrication is left on them, they lose their braking action and the articulated joints will not stop as desired when moved.

Therefore:

- You must ensure that the brake screws are completely free of lubricant!
- Residual lubricant on the brake screws must be removed immediately, e.g. with petroleum ether solvent!

#### Swivel arm brakes



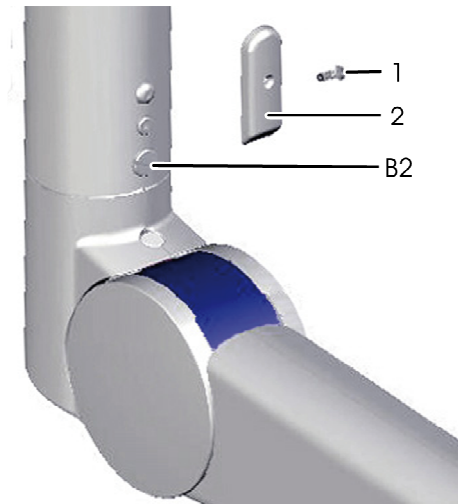
Use the brake screw (B1) to adjust the braking action to the rotation of the swivel arm.

- Turn counterclockwise to decrease the braking action.
- Turn counterclockwise to reduce the braking action.

Fig. 43 Brake screw, B1

## Mechanical adjustments

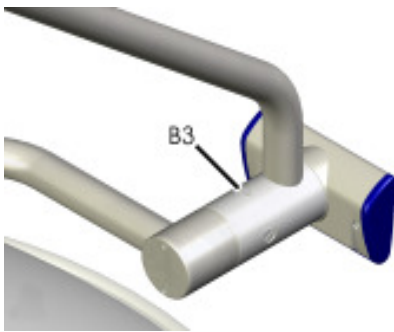
### Spring arm brakes



1. Loosen screw (1).
2. Remove the cover (2).
3. Use brake screw B2 to adjust the braking action to the rotation of the spring arm:
  - Turn counterclockwise to decrease the braking action.
  - Turn counterclockwise to reduce the braking action.
4. To reattach the cover, perform steps 1-2 in reverse order.

Fig. 44 Brake screw, B2

### Cardan joint brakes (classic cardanic)



Use the brake screw (B3) to adjust the braking action of the cardan joint:

- Turn counterclockwise to decrease the braking action.
- Turn counterclockwise to reduce the braking action.

Fig. 45 Brake screw, B3 (A.C.)

## Mechanical adjustments

### Cardan joint brakes (flat cardanic)

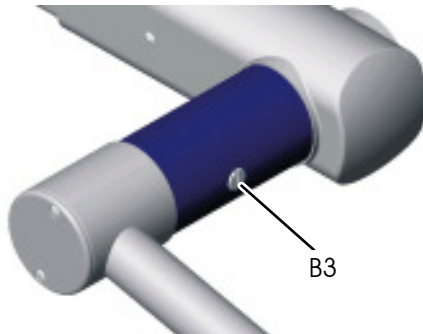


Fig. 46 Brake screw, B3 (N.C.)

Use the brake screw (B3) to adjust the braking action of the cardan joint:

- Turn counterclockwise to decrease the braking action.
- Turn counterclockwise to reduce the braking action.

### Light head brakes

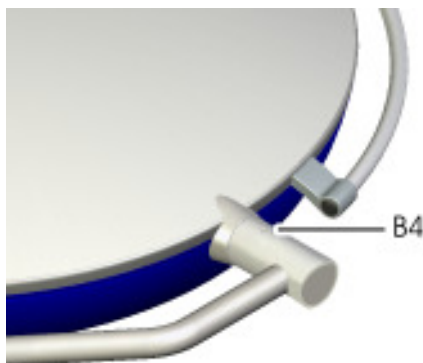


Fig. 47 Brake screw, B4

Use the brake screw (B4) to adjust the braking action to the rotation of the light head.

- Turn counterclockwise to decrease the braking action.
- Turn counterclockwise to reduce the braking action.

## Mechanical adjustments

### 12.3 Adjusting the height stop and counterweight

#### Spring arm height stop (classic cardanic)



**NOTE!**

*For a low ceiling, you can adjust the spring arm height down to a horizontal position.*



**CAUTION!**

**Risk of injury from uncontrolled moving parts!**

The spring arm is under a high level of tension. The spring arm can move erratically of its own accord and cause injury.

Therefore:

- Do not set the adjustment screw until assembly is complete.

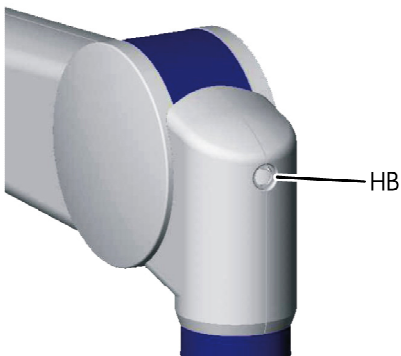


Fig. 48 Adjustment screw, HB

1. Remove the end cap using a small screw driver.  
The HB adjustment screw for the height stop is beneath the end cap.
2. Put the spring arm in a horizontal position.
3. Use the HB adjustment screw to adjust the height limit:
  - Turn clockwise to reduce the height.
  - Turn counterclockwise to increase the height.
4. Replace the end cap.

## Mechanical adjustments

### Spring arm height stop (flat cardanic)

Special tools

- Steel pin, Ø 4 mm

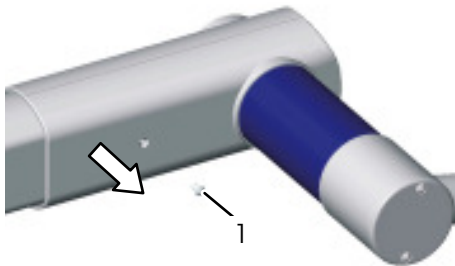


Fig. 49 Cover

1. Remove the mounting screw (1).
2. Pull off the cover in the direction of the arrow.

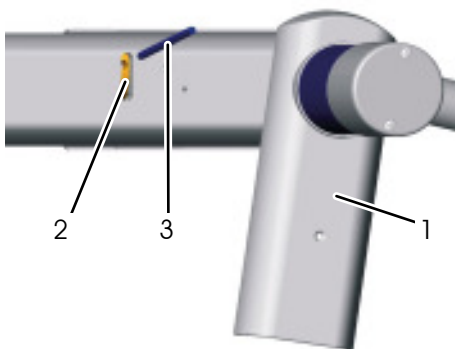


Fig. 50 Ring nut

3. Turn the cover (1) down as pictured.
4. Position the spring arm so the ring nut (2) appears in the slit.
5. Use the steel pin (3) to rotate the ring nut until the desired height limit is reached:
  - Turn clockwise to reduce the height.
  - Turn counterclockwise to increase the height.
6. To reattach the cover, perform steps 1-4 in reverse order.

## Mechanical adjustments

### Spring arm counterweight

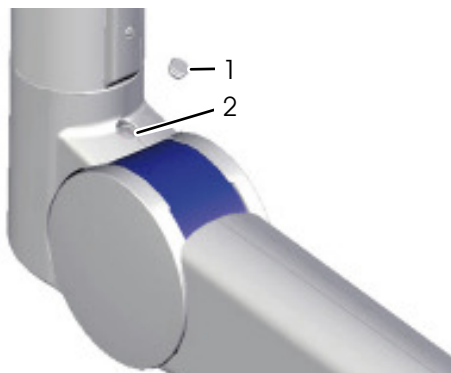


Fig. 51 Screw for adjusting spring tension

1. Remove the end cap (1) with a small screw driver. The counterweight adjusting screw, F (2), is located under the end cap.
2. Put the spring arm into a position as close to horizontal as possible so that adjusting screw F (2) is easy to access with a ball-head Allen wrench.
3. Use adjustment screw F to adjust the spring tension:
  - Turn clockwise to increase the spring tension.
  - Turn counterclockwise to reduce the spring tension.
4. Replace the end cap.

## Maintenance and inspection

# 13 Maintenance and inspection

## 13.1 Safety

### Personnel

- Unless otherwise indicated, the maintenance tasks described here are performed by the operator.
- Some maintenance work may be done only by specially trained technicians or the manufacturer; these tasks are marked accordingly.
- Only skilled electricians may perform any electrical work.

### Personal protective equipment



#### NOTE!

*The individual warning notices in this section indicate the protective equipment to be worn for each task.*

### Basic information



#### WARNING!

#### **Risk of injury due to improperly performed maintenance!**

Improper maintenance can cause severe injury or damage.

Therefore:

- Before beginning installation, ensure there is adequate space.
- If components are removed, be sure to note the correct installation; correctly reinstall all fasteners and observe correct torques.

## Maintenance and inspection

### 13.2 Cleaning, disinfection and sterilization

#### General cleaning and disinfection

The cleaning and disinfection of the operating light shall only be made by a hygiene specialist or the person who is instructed by the hygiene specialist.

Only chemicals which have been tested in terms of material compatibility and released by BERCHTOLD shall be used. Special care is necessary for the choice of the chemical product as well as their concentration.

If the each current list, which can be view on the internet and is also available on request (⇒ back side of cover), does not include a disinfectant or detergent, it shall not be used, since functional components can be modified or damaged.

Prior to actual disinfection, perform a thorough cleaning to remove any visible impurities, such as blood, etc.

Do not use any sharp, pointed or abrasive objects during cleaning, as there is always a risk of damaging the surface. Damaged surfaces become exposed to chemical substances during subsequent cleaning or disinfection. This damages the surface.

Therefore, only a soft brush and a mild cleaning agent (or a cleaning disinfectant) are allowed for cleaning heavy and stubborn impurities. When all visible impurities are gone, disinfection is performed.



**NOTE!**

*Any implied warranty claim terminates when these guidelines are ignored.*



**NOTE!**

*The implied warranty is only valid for undamaged surfaces!*

## Maintenance and inspection

### Recommended cleaners and disinfectants



**NOTE!**

*Current recommendations:*

- *Surface disinfectants and detergents for manual preparation.*
- *Disinfectants and detergents for automatic preparation*

*can be viewed on the internet and are also available on request (⇒ back side of cover).*



**NOTE!**

*The operator should refer to recognized standards for hygiene and disinfection.*

### Wet disinfection instructions for support system, light head and wall control unit

When cleaning, only a thin liquid film may be applied.

After wiping, a thin, coherent, moisturizing film is - from the perspective of microbiological efficiency - sufficient; the surface does not have to be "drenched".

In order to prevent a build-up of disinfectant material, clean regularly with a mild all purpose cleaner.

Regularity depends on the frequency of the treatment. We recommend that cleansing be performed at least once a month.

Clean the surgical lights with a damp cloth only, not a wet cloth.

## Maintenance and inspection



### CAUTION!

**Improper use of disinfection products can lead to product damage!**

Not following or adhering to the information and instructions in this chapter can result in product damage!

It also voids any implied warranty claims!

Therefore:

- When cleaning and disinfecting, make sure that no liquid penetrates the light head or support system components.
- The surface disinfectants may only be used in the concentration prescribed by the manufacturer.
- The use of NATRONLAUGE can cause surface changes on coated aluminum components and impair the service life of the product.
- If the surface disinfectant is used incorrectly, such that a large amount of liquid remains on the surface, it will cause increased coating dissolution because the product is continually "shifted" around the surface but never removed. In case of an increased layer composition of surface disinfectant, it must be thoroughly cleansed.

## Maintenance and inspection



- Due to possible damage to the materials, no solutions are suitable that are based on halogen-splitting bonds, strong organic acids and oxygen-splitting bonds, solvents, fuel or other.
- In order to avoid damages to the stainless steel parts, only use disinfectants without chlorides or halogenoids.
- Avoid contact between aldehyde and amino products.  
Therefore, especially if an amino-based product was used previously, before applying the aldehyde-based disinfectant for the first time, an intermediate cleaning step has to be performed. This is very important because disregarding this step may result in residue no longer being able to be removed.
- With regard to the microbiological effectiveness, please contact the manufacturer of the disinfectant

## Maintenance and inspection

### Handle sleeves, manual disinfection

Disinfect the handle sleeves as follows:

- Alcohol, QAV or aldehyde-based disinfectant.
- After cleaning, make sure to completely rinse the sleeve with water to remove any residue.



#### **CAUTION!**

**Incorrect manual disinfection causes product damages!**

Not following or adhering to the instructions listed can result in product damage!

It also voids any implied warranty claims!

Therefore:

- Avoid dipping in enzyme-based cleaner for long periods.

### Handle sleeves, thermal preparation

The handle sleeves are made of heat- and impact-resistant plastic.

Prepare the handle sleeves as follows:

- Use alkaline-based cleaner without active chlorine
- Neutralize with acidic neutralizer

The handle sleeves can be machine cleaned via thermodisinfection at temperatures of up to 93° C for 10 minutes.

## Maintenance and inspection

### Handle sleeves, sterilizing

Clean and disinfect handle sleeves in the usual way before sterilization.

The handle sleeves are placed in a suitable sterilization packaging (one-time sterilization packaging, e.g. film/paper sterilization bags; single or double packaging) and sterilized.

The handle sleeves can be steam sterilized. The recommended parameters are:

- 121°C/1.3 bar; 25 to 30 minutes (standard)
- 134°C/ ca. 3 bar; 3 minutes (standard)
- 134 °C/2-3 bar; 18 minutes (special cases)

When loading the autoclave, make sure the open end of the sleeve is pointing down. Allow sufficient space around each handle sleeve and do not allow them to come in contact with any other items being sterilized.



#### **CAUTION!**

##### **Incorrect use of disinfectants can cause product damages!**

Not following or adhering to the instructions listed can result in product damage!

It also voids any implied warranty claims!

Therefore:

- Hot air, ethylene oxide, formaldehyde and low-temperature plasma sterilization are not permitted.



#### **CAUTION!**

##### **Limited warranty on handles!**

Sterilizable handles are subject to natural wear.

Therefore:

- It must be pointed out that a normal life time of approx 100 cleaning cycles is possible.
- Damaged handles must not be used.

## Maintenance and inspection

### 13.3 Maintenance schedule

The following sections describe the maintenance work required for optimal and trouble-free operation.

If you have any questions on maintenance tasks and intervals, contact BERCHTOLD (⇒ *service address on inside back cover*).

Interval	Maintenance task	Who should perform
Daily, before each use	General function tests	Operator
As needed	Changing LED modules	BERCHTOLD/ authorized company
As needed	Change on-site mains fuses	Electrical technician
Annually	General maintenance in accordance with maintenance scope	BERCHTOLD/ authorized company

## Maintenance and inspection

### 13.4 Maintenance

#### 13.4.1 Function tests before each use

- To be completed by the operator.

Each day, before using the CHROMOPHARE® lights, perform the function tests described at the beginning of the *Operation* section.

#### 13.4.2 LED modul replacement

- Performed by BERCHTOLD or a company authorized by BERCHTOLD.



#### CAUTION!

**Property damage due to unauthorized replacement of LED modules!**

If defective LED modules are replaced by insufficiently qualified persons, significant damage to property can result.

Any and all implied warranty claims will also be invalidated by non-compliance!

Therefore:

- LED modules may only be replaced by BERCHTOLD or a company authorized by BERCHTOLD.

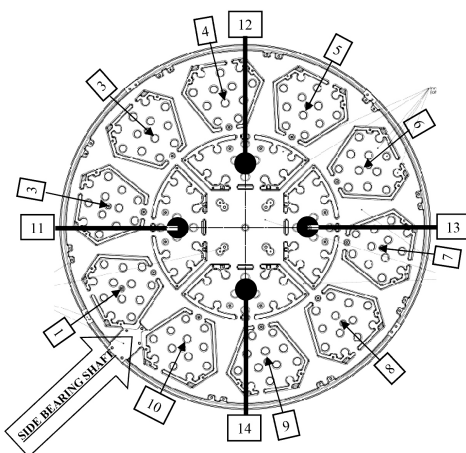


Fig. 52 Overview LED modules

Numbering of the LED modules begins at the side shaft bearing counted clockwise

## Maintenance and inspection

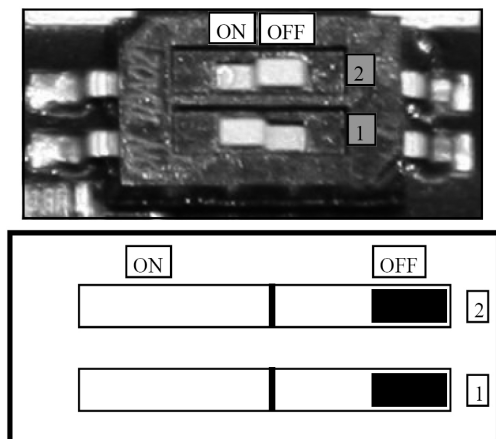


Fig. 53 DIP switch on LED modul



### NOTE!

#### CAN-Bus end of line resistance:

The end of line resistance allows an interface free communication between the CAN-Bus components. The resistor (DIP switch 2) on the first and the last module within a light head must be switched on.

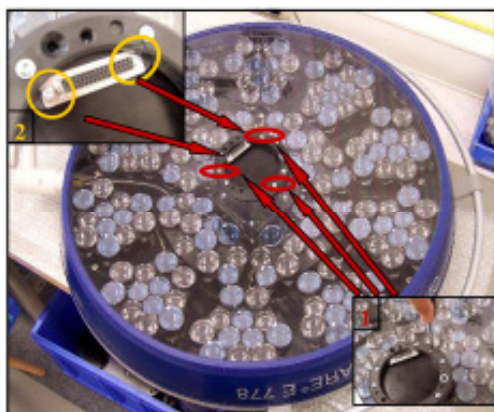


Fig. 54 Remove screws

1. Remove the three screws fixing the black plastic ring although remove the screws fixing the interface plug on the lower glass holder.

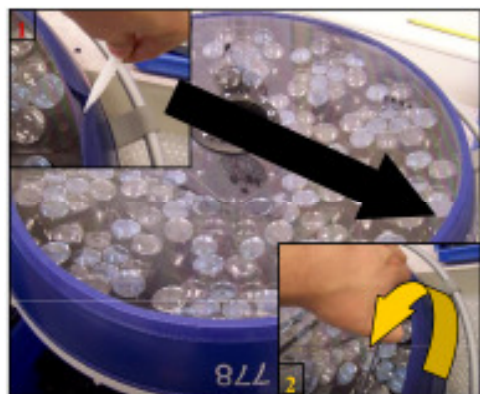


Fig. 55 Lift silicone ring, remove glass

2. Use a acuate tool to lift the silicone seal to remove the glass.
3. Carefully remove the glass.

## Maintenance and inspection

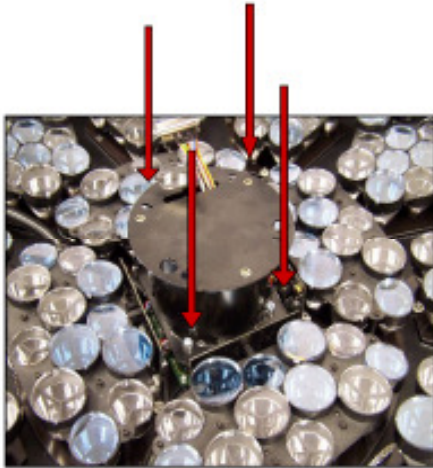


Fig. 56 Remove screws

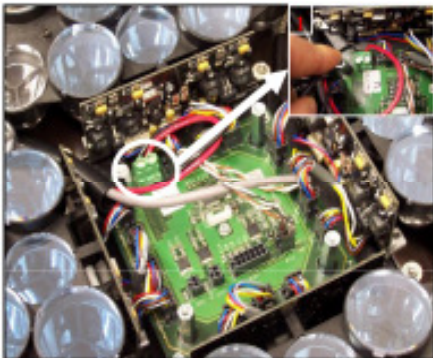


Fig. 57 Disconnect power supply

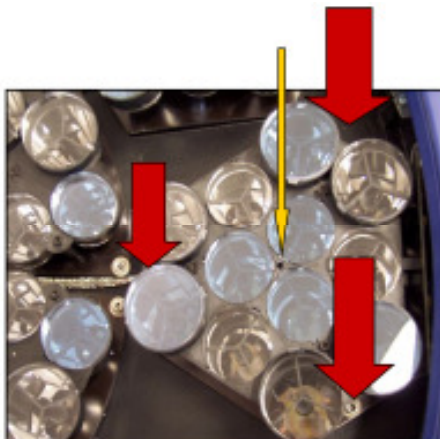


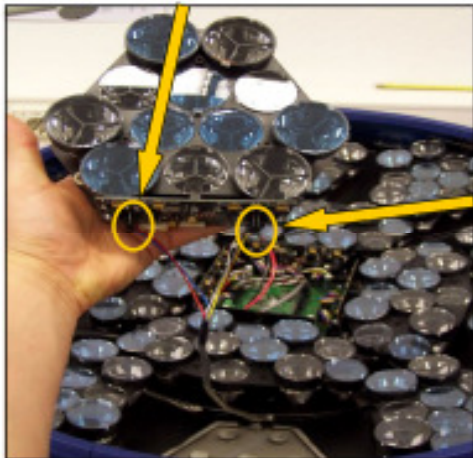
Fig. 58 Undo LED modules

4. Remove the four screws shown by the arrows.

5. Disconnect the power supply on the junction board.

6. The LED module is finished with three hexagonal socket screws (see red, fat arrows) and a grub screw (see yellow, narrow arrow) remove the hexagonal socket screws completely and undo the grub screws. The module is now free.

## Maintenance and inspection



*Fig. 59 Screw for adjusting spring tension*

7. Pull out the LED module and disconnect the two plugs on the LED control boards (see arrows).

8. Connect the new LED module and put everything back together.

## Maintenance and inspection

### 13.4.3 Replacing (on-site) fuses

- To be performed only by a skilled electrician.



**DANGER!**  
**Risk of death from electrical current!**

Touching live electrical components is life threatening. Damage to insulation or individual components can cause fatal injury.

Therefore:

- Electrical work is to be performed by skilled electricians only.

Both the mains and emergency power fuses are located in an external control cabinet for easy replacement in the event of failure.

The fuse values are listed in the *Appendix*.

## Service Menu

### 14 Service Menu

#### Basic information

The Service menu is implemented as a part of the keypad software and is activated via the Service button. The individual LEDs of the brightness display help to distinguish between the various menu items. In the main menu the Brighter and Darker buttons are used to switch through the different positions. For activating a position the Standby button is used. In the submenus the Brighter button is used to raise the adjustments while the Darker button is used to decrease the adjustments. In order to exit a submenu without executing the function, the Service button is used to cancel. Thereafter, menu item one from the main menu is selected.

To get from a submenu to main menu press the Service button for a short time leave the service menu by pressing the Service button for about 3 seconds.

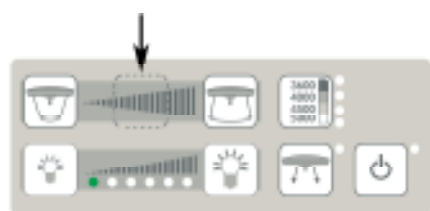


Fig. 60: Service button

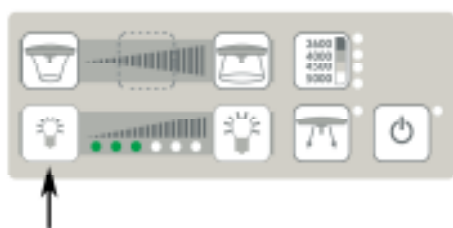


Fig. 61: Menu item 3

1. In order to actuate the Service menu, the **Service button** has to be pressed for more than 3 seconds until the first LED of the brightness display *lights up green*.
2. By pressing the **Darker** button numerous times, select menu item 3. This is displayed by the *lighting* three LEDs of the brightness display.

## Service Menu

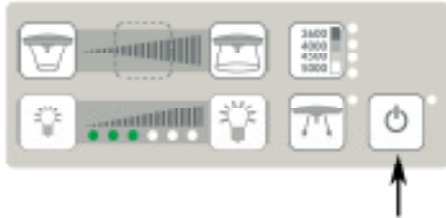


Fig. 62: Confirming menu item 3

3. By pressing the **Standby** button, menu item 3 is confirmed.

Thus the address appointed via the DIP-switches on the keypad PCB will be send to all connected modules.



### NOTE!

*The light head which is about to be addressed must not be connected with another light head via CAN-Bus.*

*For dual control lights the wall control must be addressed manually first.*

*For wall control lights all light heads not about to be addressed must be disconnected from CAN-Bus at the swivel arms. The addressing is done via wall control.*

LED surgical lights, single and combination lights CHROMOPHARE® E 778, E 668, E 558

## Appendix

# 15 Appendix

## 15.1 Consumables

Item	Part No.
Handle sleeve, standard (1 piece)	CZ 4990604
Handle sleeve for ChromoVision® HD, 1 C and ECO (1 piece)	CZ 4990704
Handle sleeve, small protection collar (1 piece)	CZ 4990904

**- NOTES -**

## Appendix

### 15.2 Diagrams

#### 15.2.1 CHROMOPHARE® E 778

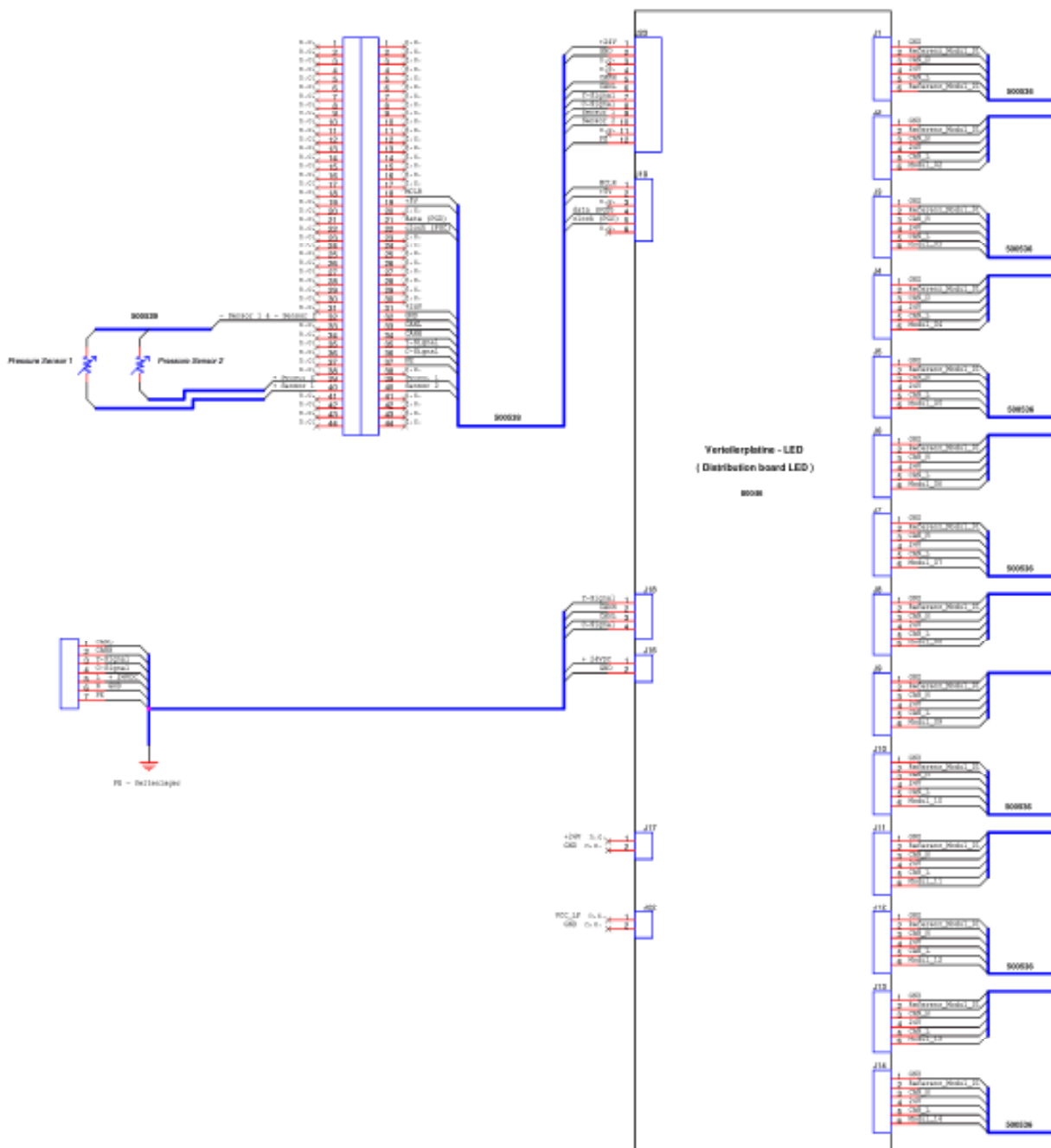


Fig. 63 Diagram CHROMOPHARE® E 778

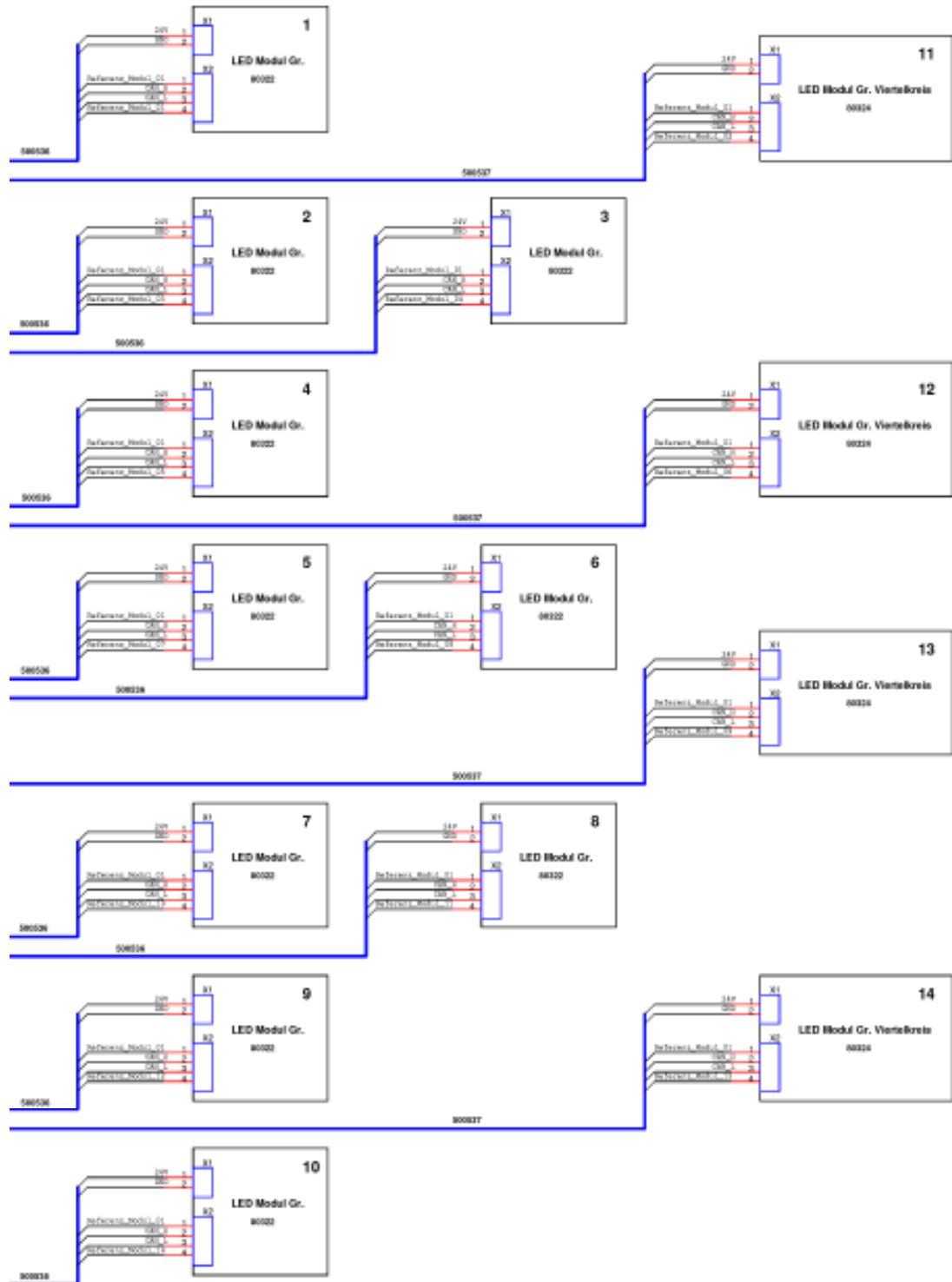


Fig. 64 Diagram CHROMOPHARE® E 778

Fig. 65 Diagram CHROMOPHARE® E 778 with ChromoVision® HD and 1 C (NTSC)

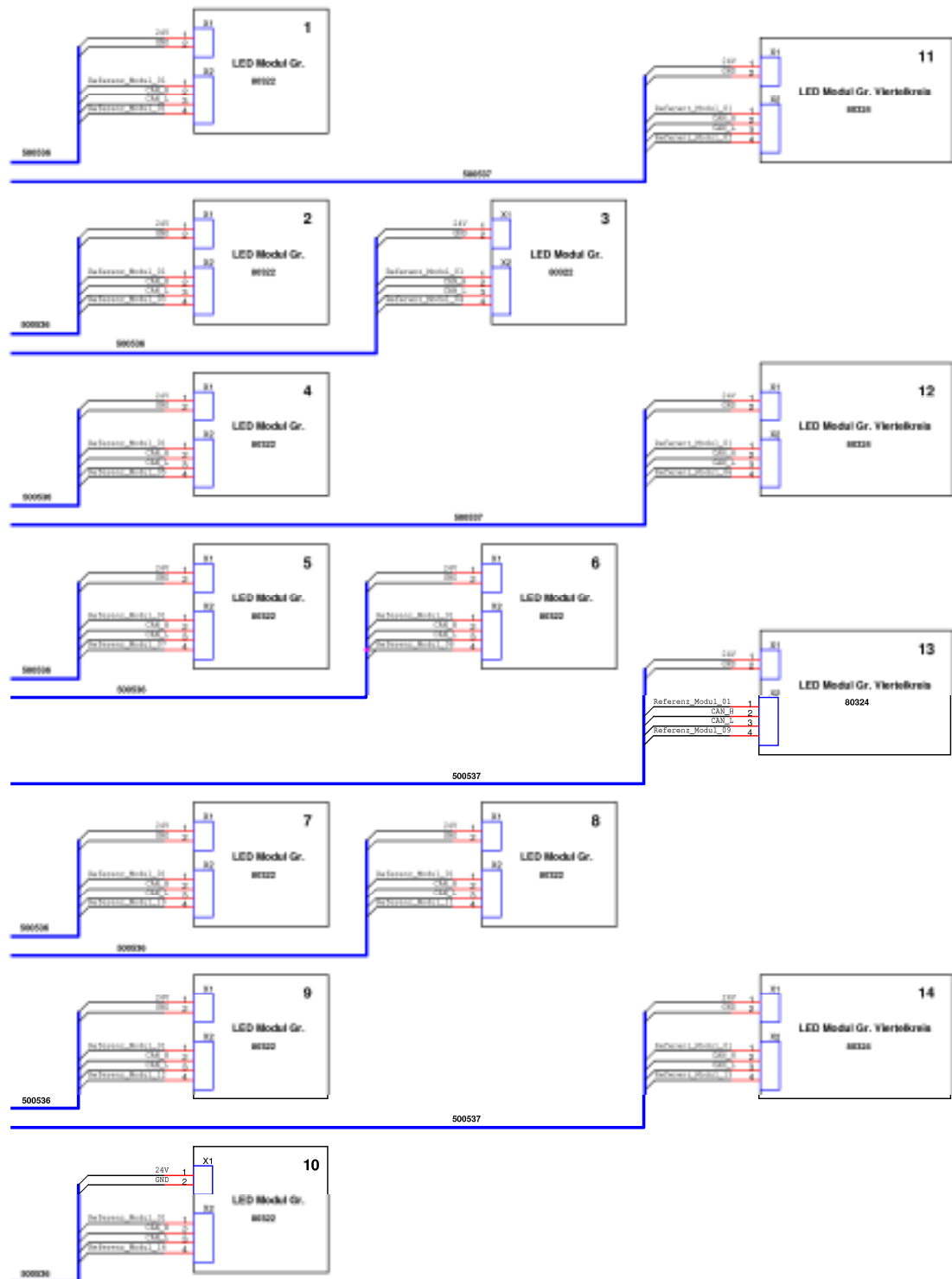


Fig. 66 Diagram CHROMOPHARE® E 778 with ChromoVision® HD and 1 C (NTSC)

## Appendix

### 15.2.3 CHROMOPHARE® E 778 with ChromoVision® HD and 1 C (PAL)

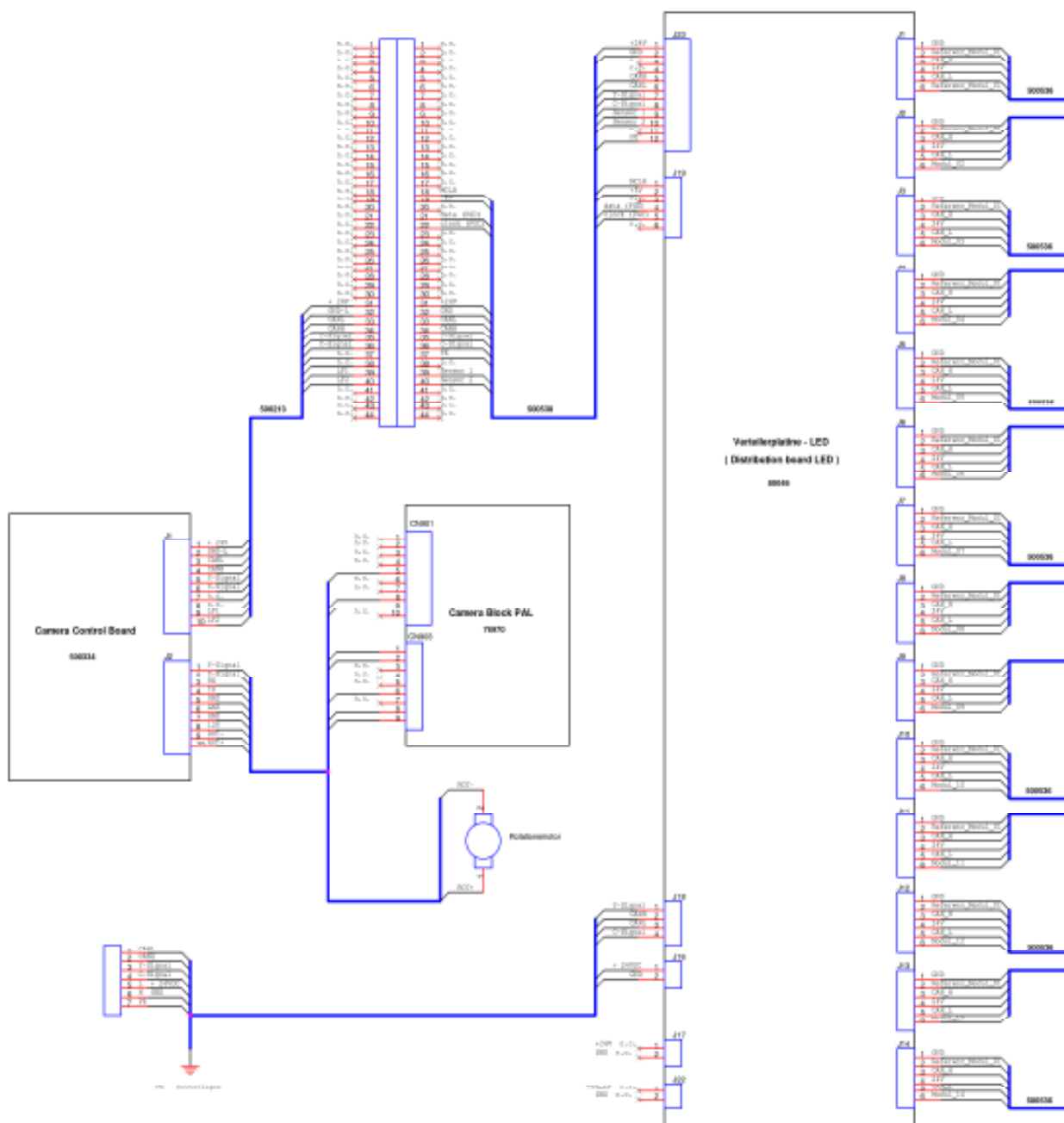


Fig. 67 Diagram CHROMOPHARE® E 778 with ChromoVision® HD and 1 C (PAL)

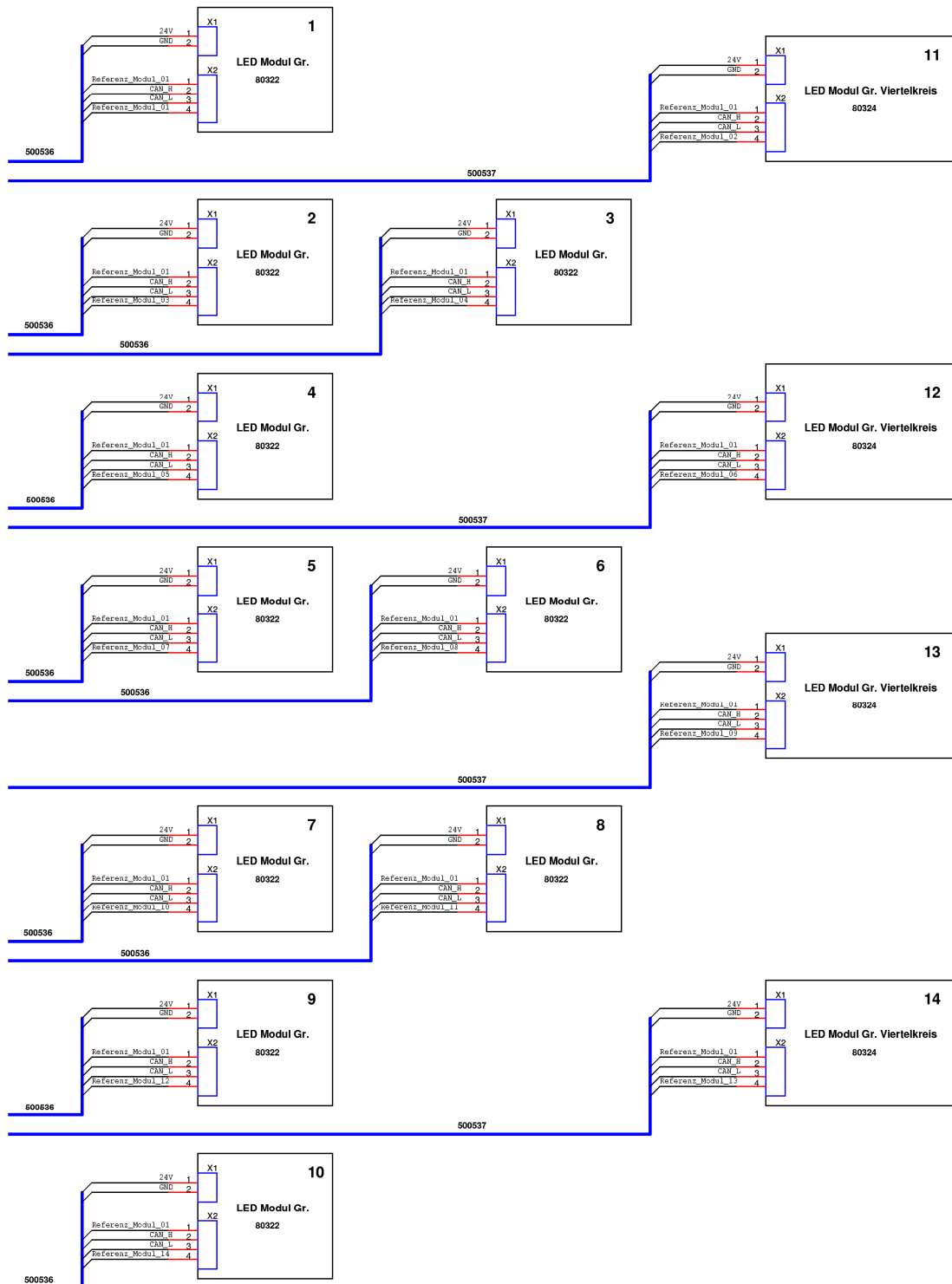


Fig. 68 Diagram CHROMOPHARE® E 778 with ChromoVision® 1 C (PAL)

## Appendix

### 15.2.4 CHROMOPHARE® E 668

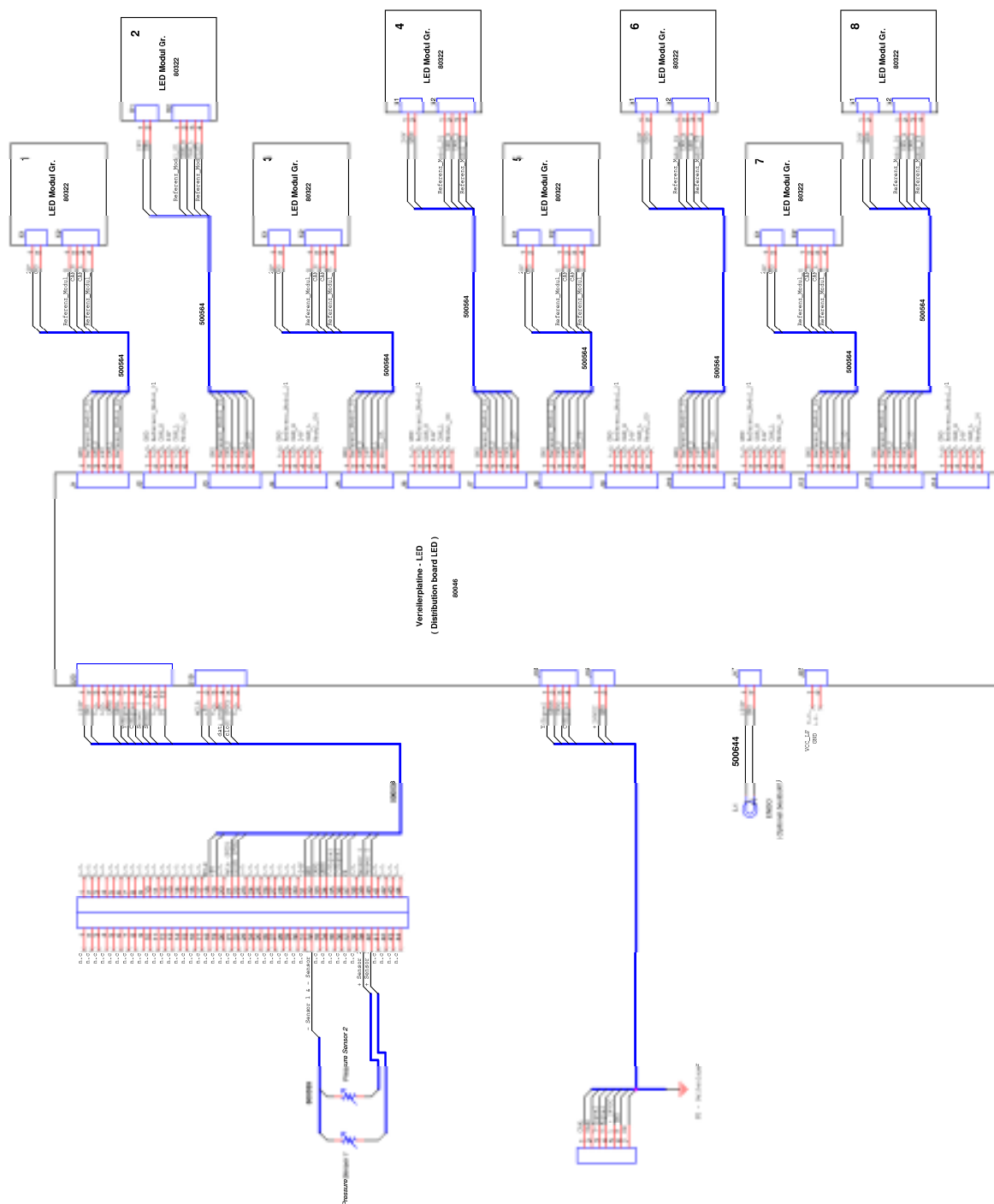


Fig. 69 Diagram CHROMOPHARE® E 668

### 15.2.5 CHROMOPHARE® E 668 with ChromoVision® HD and 1 C (NTSC)

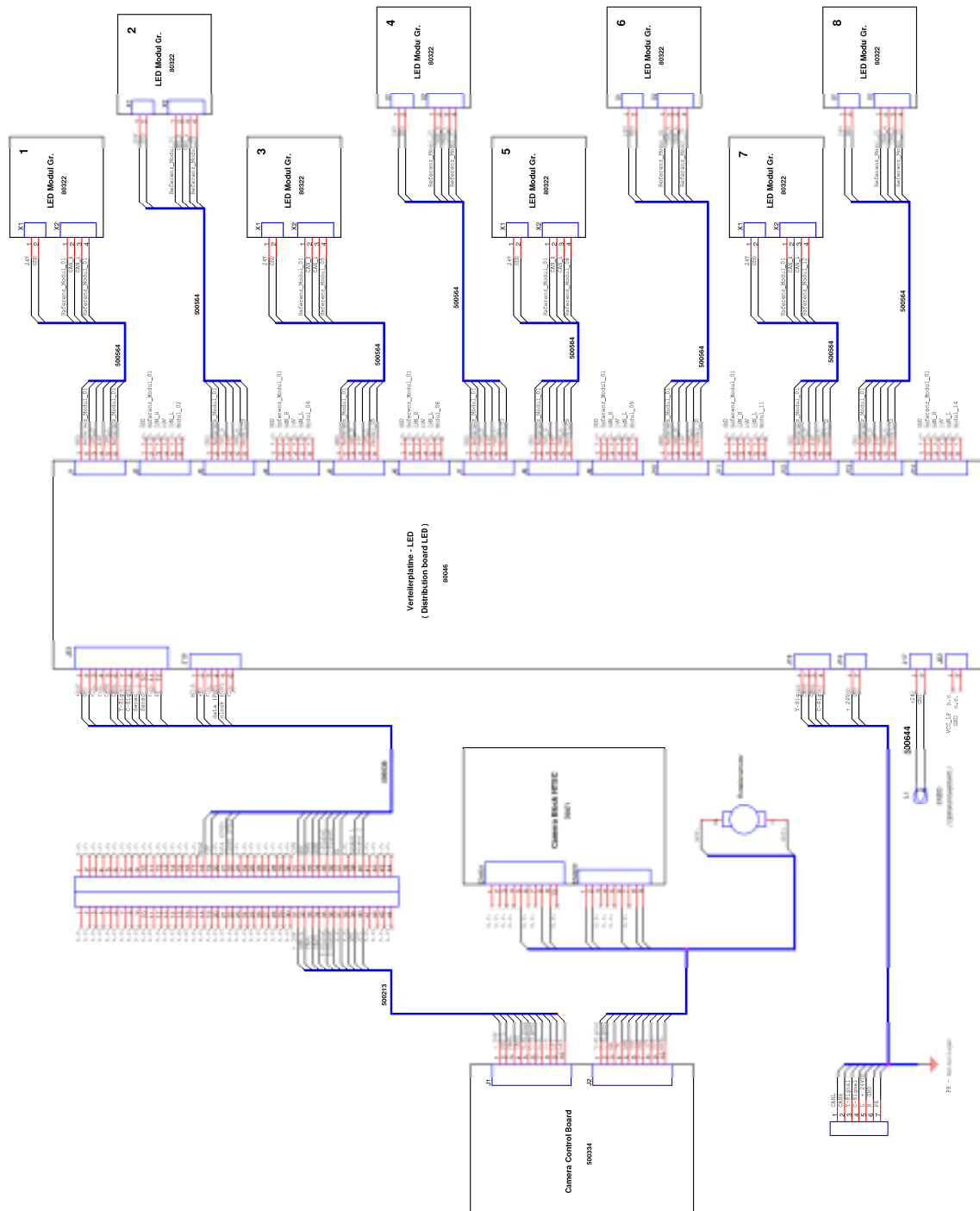


Fig. 70 Diagram CHROMOPHARE® E 668 with ChromoVision® HD and 1 C (NTSC)

## Appendix

### 15.2.6 CHROMOPHARE® E 668 with ChromoVision® HD and 1 C (PAL)

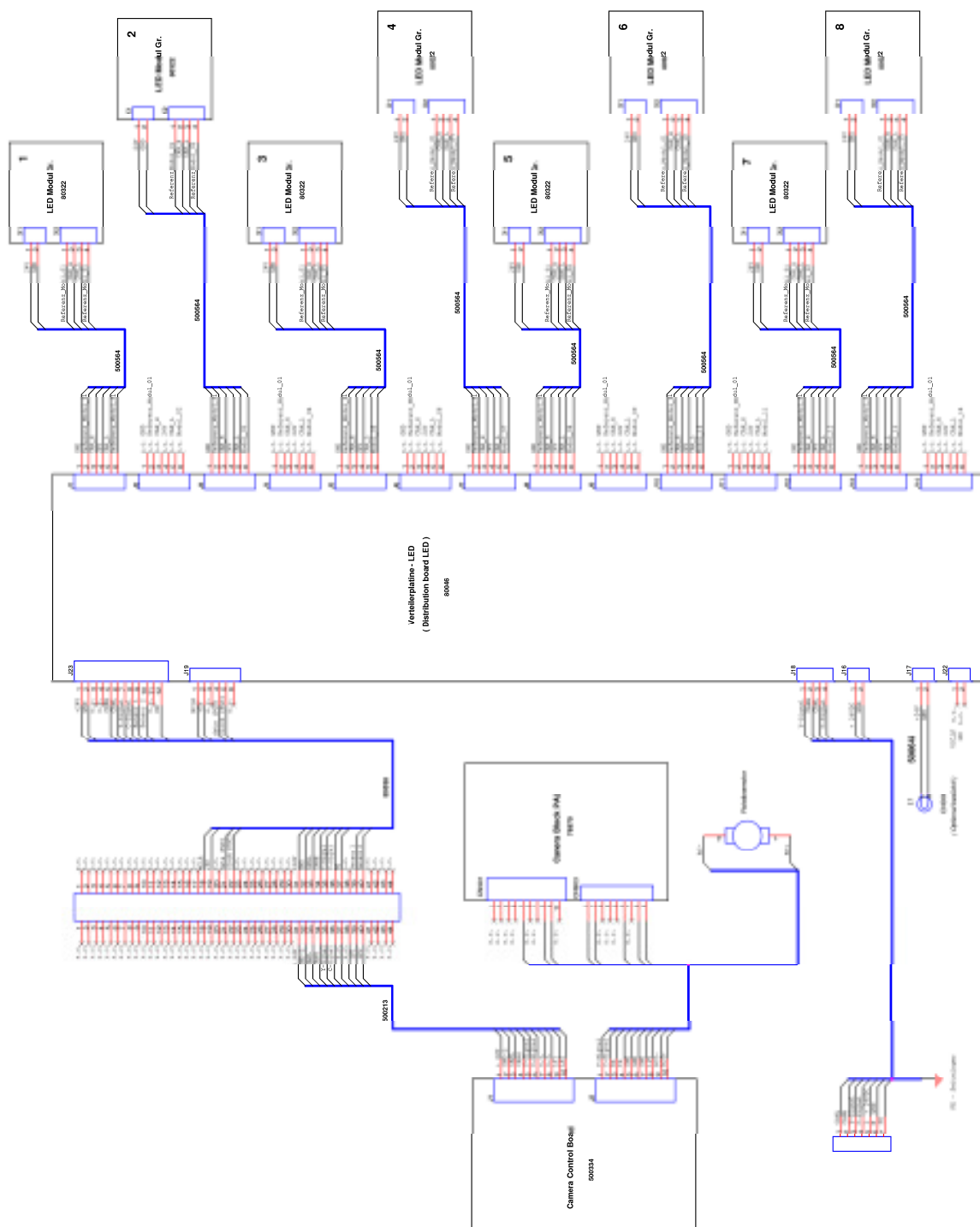


Fig. 71 Diagram CHROMOPHARE® E 668 with ChromoVision® HD and 1 C (PAL)

### 15.2.7 CHROMOPHARE® E 558

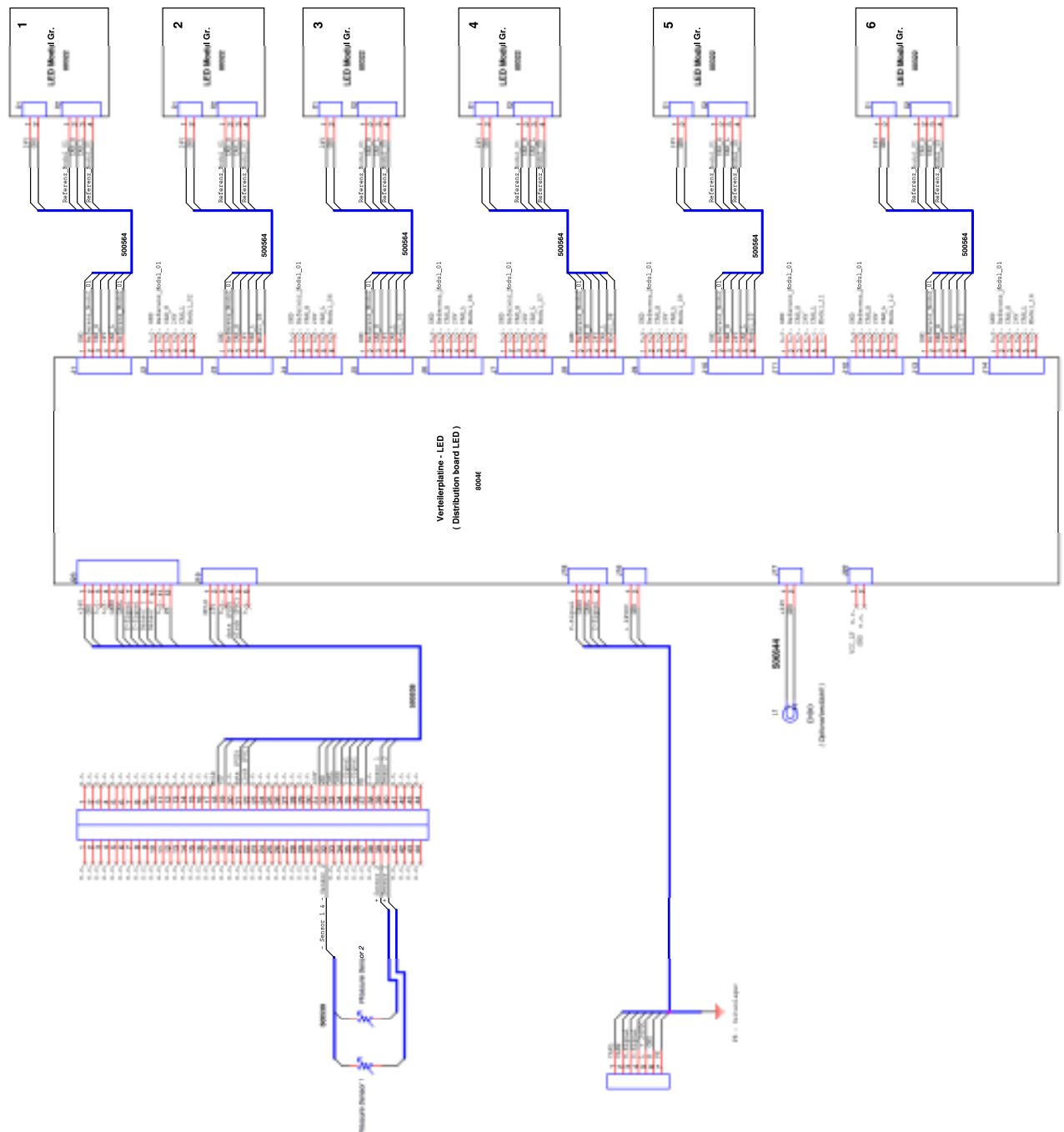


Fig. 72 Diagram CHROMOPHARE® E 558

## Appendix

[illegible]

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### 15.2.9 CHROMOPHARE® E 558 with ChromoVision® HD and 1 C (PAL)

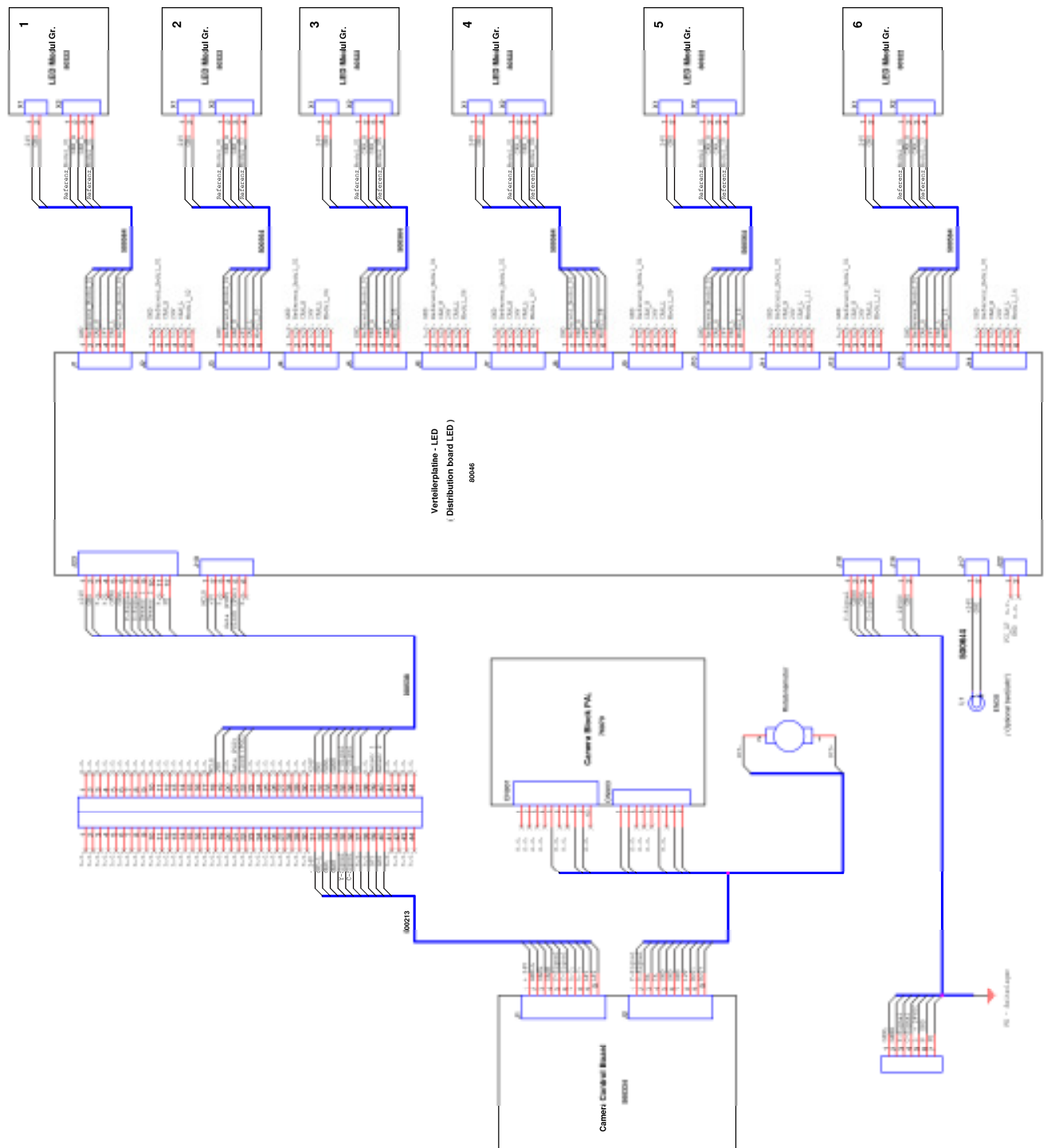


Fig. 74 Diagram CHROMOPHARE® E 558 with ChromoVision® HD and 1 C (PAL)

## Appendix

### 15.3 Fuses, terminal voltages

#### 15.3.1 Fuses

The following fuses must be supplied by the owner (all fuses: inactive):

Lighting	220 – 240 V	100 – 127 V
	L, F1	L, F1
E 778 , E 668, E 558	4 A	8 A



**NOTE!**

*Fuses must be UL and IEC 60127 approved.*

#### 15.3.2 Terminal voltages

The terminal voltages cited in the following table must be measured on the ceiling tube of CHROMOPHARE® surgical lights:

AC	DC
21.5 V (upstream filtering board)	24 (+ 1.5/- 0.3) V

## 15.4 Information on electromagnetic compatibility (EMC)

Electrical medical devices such as this are subject to special EMC precautions and must be installed and put into operation in accordance with the instructions in the operating manual.

CHROMOPHARE® surgical lights are designed for use in the electromagnetic environment specified below. The operator must ensure that the lights are used only in this environment.

### 15.4.1 Guidelines and manufacturer's declaration – Electromagnetic emissions

Emissions test	Compliance	Electromagnetic environment – Guidelines
RF emissions per CISPR11	Class B	CHROMOPHARE® lights are suitable for use in all facilities, including residential areas and those directly connected to the public power grid that supplies residential buildings.
Harmonic emissions per IEC 61000-3-2	Class A	
Voltage fluctuations	Fulfilled	

### 15.4.2 Guidelines and manufacturer's declaration – Electromagnetic interference immunity

Immunity tests	IEC 60601 test/ compliance level	Electromagnetic environment – Guidelines
Electrostatic discharge (ESD) per IEC 61000-4-2	± 6 kV contact discharge	Synthetic floors should be antistatic and the relative humidity at least 30%.
	± 8 kV air discharge	
Electrical fast transient bursts per IEC 61000-4-4	± 2 kV for power supply lines	The mains power quality should correspond to that of a typical commercial or hospital environment.
	± 1 kV for input and output lines	
Surges per IEC 61000-4-5	± 1 kV normal mode voltage	The mains power quality should correspond to that of a typical commercial or hospital environment.
	± 2 kV common mode voltage	

## Appendix

Immunity tests	IEC 60601 test/ compliance level	Electromagnetic environment – Guidelines
Voltage dips, short interruptions and fluctuations in the power supply voltage per IEC 61000-4-11 ( $U_T$ : AC mains voltage prior to application of test levels)	< 5% $U_T$ for ½ cycle (> 95% dip)	The mains power quality should correspond to that of a typical commercial or hospital environment.  To ensure continuous operation of the CHROMOPHARE® lights, they must be connected to an uninterruptible power supply in accordance with DIN VDE 0100-710.
	40 % $U_T$ for 5 cycles (60% dip)	
	70% $U_T$ for 25 cycles (30 % dip)	
	< 5% $U_T$ for 5 s (> 95% dip)	
Radiated RF fields per IEC 61000-4-3	3 V/m, 80 MHz to 2.5 GHz	For image distortion in lights with a built-in camera system, move the source of the electric fields further away from the lights or install shielding.

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### C

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